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Crystal size manipulation of acetaminophen via recrystallization

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The University of Arizona, 1993

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**CRYSTAL SIZE MANIPULATION OF ACETAMINOPHEN VIA
RECRYSTALLIZATION**

by

Rajiv Pandey

A Thesis Submitted to the Faculty of the
DEPARTMENT OF CHEMICAL ENGINEERING
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF SCIENCE
In the Graduate College
THE UNIVERSITY OF ARIZONA

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TABLE OF CONTENTS

| | Page |
|---|-----------|
| LIST OF ILLUSTRATIONS | 5 |
| LIST OF TABLES | 6 |
| ABSTRACT | 7 |
| 1. INTRODUCTION | 8 |
| 2. CRYSTAL SIZE MANIPULATION OF ACETAMINOPHEN VIA RECRYSTALLIZATION USING HIGH PRESSURE CO₂ | 18 |
| 2.1 Experimental Procedure | 19 |
| 2.1.1 Expansion Study | 19 |
| 2.1.2 Recrystallization of Acetaminophen (LAS process) | 21 |
| 2.1.3 Recrystallization of Acetaminophen (GAS process) | 23 |
| 2.1.4 Analysis of Particle size distribution | 24 |
| 2.1.5 Recrystallization by Acetaminophen (GAS prime) | 24 |
| 2.1.6 Recrystallization of Aspirin (GAS prime) | 25 |
| 2.2 Results and Discussion | 25 |
| 2.2.1 Expansion Study | 25 |
| 2.2.2 Mass mean size distribution (LAS/GAS process) | 30 |
| 2.2.3 Mass mean size distribution (GAS prime process) | 36 |
| 2.2.4 Morphology | 37 |
| 2.2.5 Crystal size distribution (coefficient of variation-CV) | 44 |
| 3. CONCLUSIONS AND RECOMMENDATIONS | 46 |
| APPENDIX A: Population Density Plots | 48 |
| APPENDIX B: PDI Counter Data | 56 |
| REFERENCES | 95 |

LIST OF ILLUSTRATIONS

| | Page |
|--|-------------|
| Fig 2.1.1 Experimental apparatus | 20 |
| Fig 2.2.1 Butanol expansion by CO ₂ | 26 |
| Fig 2.2.2 Methanol expansion by CO ₂ | 27 |
| Fig 2.2.3 CO ₂ Phase Diagram | 28 |
| Fig 2.2.4 Butanol concentration vs pressure | 29 |
| Fig 2.2.5 Mass mean size vs rate of injection (LAS PROCESS) | 31 |
| Fig 2.2.6 Mass mean size vs rate of injection (GAS PROCESS) | 31 |
| Fig 2.2.7 Acetaminophen-Original crystals | 39 |
| Fig 2.2.8 Acetaminophen Crystals (LAS PROCESS) | 40 |
| Fig 2.2.9 Aspirin Crystals (LAS PROCESS) | 40 |
| Fig 2.2.10 Aspirin Crystals (GAS PROCESS) | 41 |
| Fig 2.2.11 Acetaminophen Crystals (GAS PRIME) | 41 |
| Fig 2.2.12 Aspirin Crystals (GAS PRIME) | 42 |
| Fig 2.2.13 Aspirin Crystals (Low pressure GAS PRIME) | 42 |
| Fig 2.2.14 Benzoic Acid crystals (High Pressure GAS PRIME) | 43 |
| Fig 2.2.15 Benzoic acid crystals (Low Pressure GAS PRIME) | 43 |
| Fig 2.2.16 Coefficient of variation vs injection rate (LAS PROCESS) | 45 |
| Fig 2.2.17 Coefficient of variation vs injection rate (GAS PROCESS) | 45 |

LIST OF TABLES

| | Page |
|---|------|
| Table 2.2.1 Mass mean size dependence with holding time (LAS PROCESS) | 34 |
| Table 2.2.2 Effect of rate of injection up to threshold pressure on the mass mean size | 35 |
| Table 2.2.3 Mass mean sizes of crystals produced by GAS prime process | 37 |

ABSTRACT

The crystal size distribution (CSD) of any material determines its end use. Consequently, comminution processes are used to transform material from one size distribution to another. Often, recrystallization from solution is one of the processes used. Recently, a novel recrystallization process named the GAS process was developed to mill compounds that were thermally labile and insoluble in supercritical fluids. It was shown that the CSD could be manipulated using this process.

To further illustrate the applicability of this process, size manipulation studies of acetaminophen (a widely available drug) were performed. The aim of this work was to produce crystals in the mass mean size range of $5\mu\text{m}$ to $50\mu\text{m}$, and identify the conditions for producing the desired size distribution. A modified GAS process and a liquid anti-solvent (LAS) process were also investigated. Together with acetaminophen-butanol, other systems studied using these processes were aspirin-methanol and benzoic acid-methanol.

CHAPTER 1

INTRODUCTION

The particle size distribution (PSD) or crystal size distribution (CSD) of any material is often important and sometimes critical in the end-use application of the material (Randolph & Larson 1988). Control of CSD therefore is of great importance in crystallization. Narrow size distributions are sometimes desirable (e.g uniform bioavailability) in pharmaceutical products and in the use of monodisperse polymeric spheres as drug delivery agents, or as high performance liquid chromatography (HPLC) packings. The dosage of any drug depends upon how quickly it dissolves in the blood stream. The absorption rate depends upon the crystal size. Consequently, crystallizers are designed to produce a specific CSD.

The PSD (particle size distribution) of solid materials produced in industrial processes are often not those desired for the subsequent use of these materials. As a result, comminution and recrystallization processes are often carried out in chemicals, pharmaceuticals, dyes, polymers, and explosives industries to take a material from one size distribution to another.

A wide variety of processes are used to make a fine particle size distribution e.g simple crushing and grinding (for some compounds this must be done at cryogenic temperatures), ball milling, air micronization (also called jet impingement fluid energy milling), sublimation and recrystallization.

Recrystallization from solution can be carried out by a variety of ways e.g

thermal methods, using the temperature dependence of solubility or anti-solvent methods (using a non solvent to decrease the solubility of a solid which is dissolved in a solvent). Such processes are called "salting out" processes. Precipitation crystallization, where chemical reactions of soluble materials produces an insoluble (desired) product, is used on an industrial scale. The reactant concentration and introduction of reactants is controlled to give the desired crystal size distribution.

However, for thermally labile, shock sensitive materials and materials that degrade on exposure to the atmosphere (Krukonis 1984), the above comminution techniques are not desirable. Pharmaceuticals and explosives often fall into this category. To manipulate the crystal size distribution of such compounds recrystallization from supercritical fluids has been shown to be a possible technique. However, supercritical fluids recrystallization is not suitable for all compounds. Recently, a new technique termed the Gas-Anti Solvent (GAS) process was developed by Gallagher et.al (1989,1991) to recrystallize compounds insoluble in supercritical fluids. Chang & Randolph (1990,1991) have also used this process. The GAS process will be discussed later in this chapter.

Fluids at temperatures and pressures slightly above their critical point (termed supercritical fluids) were first found to dissolve low vapor pressure solids more than a century ago by Hannay and Hogarth (1879). Since density is a measure of the fluid's solvating power (Kumar & Johnston 1988), it is possible to dissolve compounds that would be insoluble under ideal gas conditions, and precipitate them

by expanding the compressible solvent with moderate changes in pressure. This was first observed by Hannay & Hogarth (1879), who described the precipitated solids as "snow" in gas.

Todd & Elgin (1955) studied the mutual solubility of ethylene with various polar and non-polar high molecular weight organic compounds, at temperatures from 1°C to 10°C above the critical temperature of ethylene and at pressures up to 1500 psi (Ethylene $P_c=735$ psi and $T_c=9.5^\circ\text{C}$). They found that Henry's Law was applicable up to two thirds of the critical pressure in most systems. In the critical region the solubilizing power of ethylene was extremely sensitive to small changes in pressure and temperature. The gas could be used as an extracting medium for fluid-liquid extraction. Low vapor-pressure compounds could be selectively dissolved in the gas from a mixture of compounds and recovered upon decompression. The gas could be recycled for further extraction.

Since then, supercritical fluids have been used in a wide variety of extractive applications (McKugh & Krukonis 1986) e.g coffee decaffination (Roselius et.al 1974), deasphalting of petroleum fractions (Gearhart & Garwin 1976), extraction of cholesterol from animal fats (Krukonis et al 1988), eggs (Best 1988) and extraction of pharmaceutical compounds (Larson & King 1986). Additional applications include purification and fractionation of materials such as polymers (Jentoft and Gouw 1969). Supercritical fluids can also be used as solvents to carry out chemical reactions. Applications include wastewater detoxification-oxidation of organics (Modell,1982),

and enzyme catalysed oxidation of cholesterol (Randolph et.al 1988a).

Research in the area of crystal size manipulation via supercritical fluid recrystallization is expanding. Recently it was found that rapid decompression of SF solutions, loaded with the solute, produces particles of uniform size and a narrow CSD, a phenomena known as supercritical fluid nucleation (Pauliatis et.al 1983). Rapid pressure reduction gives rise to high supersaturation ratios and uniform conditions for nucleation. This gives rise to particles that are more even in morphology and narrow in size distribution.

This technique of rapid expansion of supercritical solutions (RESS) (Matson et.al 1987a) has been applied to a number of systems to illustrate its applicability (Tom & Debenedetti 1991). Inorganic, organic, pharmaceutical, and polymeric materials were recrystallized using this technique.

Larson & King (1986) concluded that steroids like lovastatin (an anti-cholesterol drug) precipitated from SF carbon dioxide as small particles. Naphthalene (Mohamed et.al 1989) was recrystallized after rapid expansion, via a lazer-drilled nozzle, of SF carbon dioxide loaded with naphthalene. Virgin naphthalene particles were extracted with supercritical carbon dioxide at 221.4 bar and 45°C after being heated to 135°C. The precipitated particles were in the size range from 30 μm to 135 μm . The post-expansion temperature was varied from 8°C to -8°C, inside the crystallizer, producing crystals in the size range from 2 μm to 29 μm . A pre-expansion temperature change of 25-35°C from the basecase value of 135°C affected particle

size. Increasing the temperature to 170°C produced larger crystals, while decreasing the temperature to 110°C produces smaller crystals. An increase in the pre-expansion concentration of naphthalene was found to decrease the crystal size. High concentration leads to higher supersaturation ratios, which leads to high nucleation rates (Turner et al 1988, Matson et. al 1987a, McCabe et.al 1967). Lovastatin was also recrystallized by rapid expansion of supercritical carbon dioxide. Extraction of Lovastatin was done at 379 bar and precipitation at 2 bar. A 25 μm orifice was used to depressurize the mixture of Lovastatin and carbon dioxide. Particles in the population mean size range of 0.1 μm to 1 μm were produced. In contrast to naphthalene, lovastatin was found to be insensitive to changes in process conditions. Further work was also done using the same technique for recrystallization of β -carotene from SF ethylene and ethane (Chang & Randolph 1989) producing crystals in the mean size range of 0.3 μm .

A new technique for recrystallization of compounds that are difficult to comminute by conventional methods was recently introduced (Gallagher et.al 1989). In this technique the SF gas is used in a non-extractive application as an anti-solvent, termed gas-anti solvent (GAS) recrystallization. A supercritical fluid dissolves in the organic solute laden solvent and causes precipitation of the solute. The solubility of solids in a liquid expanded with a gaseous anti-solvent was modelled by Johnston and Dixon (1991). An expanded liquid molecular thermodynamic model was developed to predict the solubilities of pure solids in a liquid solvent expanded with a gaseous

anti-solvent. The model accurately predicted behaviour ranging from nearly ideal liquid solution at ambient temperatures to the highly non-ideal compressible fluid at high pressures. Solubilities of naphthalene and phenanthrene in toluene expanded with carbon dioxide was predicted. Johnston and Dixon (1991) also discussed the possibility of fractionally crystallizing naphthalene and phenanthrene by controlling the injection pressure of carbon dioxide.

Chang and Randolph (1990) also predicted solubilities of β -carotene and acetaminophen in toluene and n-butanol respectively, upon expansion by carbon dioxide. The partial molar volume change of the solvent in the liquid phase was used to calculate the equilibrium solubility at any given pressure. The partial molar volume was calculated using the Peng-Robinson equation of state.

Gallagher et.al (1989) used the GAS process to recrystallize highly sensitive energetic materials like nitroguanidine(NQ) and cyclotrimethylenetrinitramine(RDX), as an alternative to conventional methods. NQ was recrystallized from N,N dimethylformamide(DMF) and N-pyridone (NMP) using chlorodifluoromethane(CFC 22) and dichlorodifluoromethane(CFC 12). More recently, Gallagher et.al(1991) applied the GAS process to recrystallize compounds like saligenin (a pharmaceutical), steroids, and cobalt chloride using carbon dioxide. Gallagher et.al (1989,1991) showed that the rate of addition of the anti-solvent determines the crystal size distribution and morphology of the compounds investigated. Classical Gibbs nucleation theory (Gibbs 1957, Adamson 1963) was used to explain the affect of anti-

solvent addition on the crystal size distribution.

Chang and Randolph (1990) recrystallized acetaminophen from n-butanol. They also found that CSD was affected by carbon dioxide residence time when the process was run in a continuous mode with a Mixed Suspension Mixed Product Removal (MSMPR) configuration. The population mean was higher for a longer residence time. Growth and nucleation rates were calculated from the crystal size distribution.

The GAS process is an attractive alternative to SF expansion to comminute crystals because a wider range of compounds can be recrystallized. In SF expansion, the solute of interest must be soluble in the SF. Simple supercritical fluids like carbon dioxide are limited in their range of solubility for non-volatile solutes. Most polar and many non-polar compounds are only sparingly soluble or insoluble (Johnston et.al 1991) in carbon dioxide. Therefore recrystallization will not be possible or may lead to low yields, and would prove uneconomical. Furthermore, carbon dioxide may react with the solute of interest near critical conditions yielding undesirable products. Often it is necessary to use co-solvents such as alcohols. Tavana et.al (1989) found solubility enhancement of cholesterol of nearly seven times in supercritical carbon dioxide by using methanol as a co-solvent. Solubility of griseofulvin was enhanced nearly four times by addition of cyclohexanone. Larson and King (1986) recrystallized lovastatin using 3%-5% methanol in carbon-dioxide. Addition of methanol enhanced solubility by almost an order of magnitude. Surfactants may also

Surfactants may also be added to enhance solubility (Dobbs & Johnston 1987). Fluids with higher critical temperatures can be used. However, higher temperatures could be detrimental to the product and in some cases co-solvents can have undesirable effects on nucleation. Impurities like co-solvents can affect crystal nucleation and growth (Botsaris 1982). In addition, crystals may be impure due to co-solvent entrainment.

In the GAS process, the solvent chosen must expand substantially upon addition of the anti-solvent gas. The solute of interest must be insoluble in the gas, even at critical conditions. These criteria are satisfied by most organic compounds and hence this process is widely applicable.

The GAS process has also been used in a separations role to fractionally crystallize β -carotene from its oxides by Chang and Randolph (1991). An enriched trans- β -carotene was obtained from its cis-isomers. Separation and purification of β -carotene illustrates the fact that purification as well as size manipulation can be done by the GAS process.

Furthermore, liquid carbon dioxide has been shown to possess some interesting properties. Liquid carbon dioxide was found to be completely miscible in aliphatic and monocyclic hydrocarbons (Francis 1954). Carbon dioxide exhibits dual solubility effects which are apparently antagonistic. At moderate concentrations up to 40 wt % it acts as a gas and exerts a strong mixing action. At higher concentrations from 60 to 90 wt% it is a relatively poor solvent for many of these same liquids. It exerts a

precipitating affect more intense than that of propane in deasphalting operations. Francis (1954) studied 261 compounds and more than half were miscible with liquid carbon dioxide.

Gases at higher pressures can also act as precipitating agents. Elgin and Weinstock (1959) showed that ethylene when dissolved in water-organic liquid mixtures at elevated pressures, reduces the mutual solubilities of these liquid components. This phenomena can be exploited in the separation/extraction of one liquid from another. Dehydration of methylethylketone is done by "salting out" water from the mixture with high pressure ethylene.

Another interesting application of high pressure carbon dioxide, somewhat similar to that of the GAS process, is in the polymer industry. Several recent studies have shown that carbon dioxide can swell polymers (Fleming and Koros 1986, Wissinger and Pauliatis 1987, Shim and Johnston 1989). Swelling of polymers by gaseous carbon dioxide is faster than liquid solvent addition. This allows diffusion of a solute which may be an impurity to be extracted from the polymer, or an additive to be impregnated into the polymer (Berens et.al 1988).

The goal of this work was to apply the technique of antisolvent addition to manipulate the size of acetaminophen, a widely available pharmaceutical, to illustrate the applicability of this process to a wider range of compounds. Acetaminophen was recrystallized from butanol by Chang and Randolph (1990), but extensive size manipulation studies were not performed. The aim of this work was to produce

acetaminophen crystals over a wide size range, from a mass mean size range of $5\mu\text{m}$ to $50\mu\text{m}$, and to study the affect of rate of anti-solvent addition on the size distribution.

CHAPTER 2

CRYSTAL SIZE MANIPULATION OF ACETAMINOPHEN BY RECRYSTALLIZATION USING HIGH PRESSURE CO₂

Supercritical Fluid (SF) recrystallization is limited in its application to comminute compounds because most polar and many non-polar compounds are insoluble or only sparingly soluble in the preferred solvent, carbon dioxide. Biomolecules and pharmaceutical compounds often have high melting points and thus low solubilities in SF. Furthermore, in the pharmaceutical industry, the preferred solvent CO₂ may react with compounds of interest at critical conditions. CO₂ is also non-selective. These properties make separation and purification of compounds difficult (Schaeffer et.al 1988, Chang and Randolph 1989, Kurnik and Reid 1982).

GAS (Gas-Anti-Solvent) recrystallization (Gallagher et.al 1989,1991, Chang and Randolph 1990) was shown to be an effective method to comminute compounds insoluble in supercritical fluids. In this process, the solute of interest is dissolved in a solvent. The anti-solvent (such as CO₂) is injected into this mixture as a compressed gas. At high pressures, the gas dissolves in the solution, causing precipitation of the solute. The rate of gas injection determines the crystal size distribution.

To investigate applicability of this process to more systems, experimental studies were done to produce a wide size range of acetaminophen crystals. Acetaminophen is a widely used drug, which is present in Tylenol® (a multi-purpose

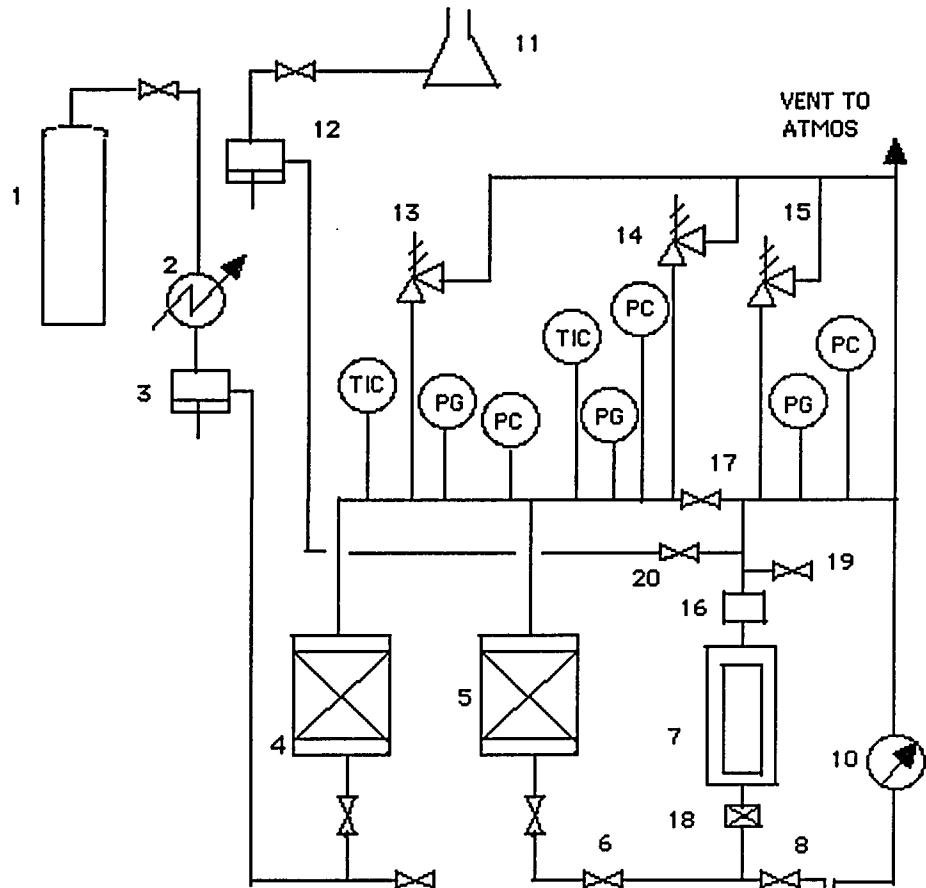
medicine). Acetaminophen was recrystallized from n-butanol.

2.1 Experimental Procedure

2.1.1 Expansion Study

An expansion study of n-butanol by CO₂ was done to see if the solvent would expand (due to dissolution of CO₂) to facilitate crystallization. A Milton-Roy supercritical extraction system X-10, suitably modified, was used for the experimental studies. The high pressure expansion was done in a Jerguson gage (model 14-T-20). The Jerguson gage was volume calibrated by adding known amounts of water in the cavity. 20 ml of n-butanol was added to the cavity via the filling port (see Figure 2.1.1). CO₂ was passed through the chiller to be liquified and then pumped into the two surge tanks. The pressure in the surge tanks was allowed to reach 1000 psi before addition of CO₂ to n-butanol. The pressure was maintained using the Tescom back-pressure regulator (pressure controller). When the system reached 1000 psi, CO₂ was added to the Jerguson gage via the bottom injection valve (see Figure 2.1.1). CO₂ was allowed to flow through the solution and out the top of the Jerguson via the filling port to flush out any air in the system. CO₂ addition was stopped and the filling port sealed tight.

CO₂ was added via the bottom valve at 100 psi increments every minute. The temperature of the piping at the entrance to the Jerguson gage was recorded. This was assumed to be the actual temperature inside the Jerguson gage. The change in volume of the n-butanol was recorded upon addition of CO₂.



- | | |
|-----------------------------|-------------------------------|
| 1) CO ₂ CYLINDER | 10) WET TEST METER |
| 2) CHILLER | 11) SOLVENT FLASK |
| 3) CO ₂ PUMP | 12) SOLVENT PUMP |
| 4) SURGE TANK#1 | 13) RELIEF VALVE#1 |
| 5) SURGE TANK#2 | 14) RELIEF VALVE#2 |
| 6) BOTTOM INJECTION VALVE | 15) RELIEF VALVE#3 |
| 7) JERGUSON GAGE | 16) SONOTEK AEROSOL GENERATOR |
| 8) DRAIN VALVE(HEATED) | 17) TOP INJECTION VALVE |
| 9) SOLVENT COLLECTION FLASK | 18) FILTER HOUSING |
| | 19) FILLING PORT |
| | 20) MICROMETERING VALVE |

Figure 2.1.1: Experimental Apparatus

The process was repeated to investigate the effect of temperature on the expansion of n-butanol. The desired temperature of CO₂ was achieved by heating the CO₂ in the surge tanks via an on-off temperature controller. To avoid cooling due to the Joule-Thompson effect the downstream piping was heated with a wrapped heating tape. The true temperature of CO₂ was again recorded at the inlet fitting to the Jergusson gage. The process was also repeated for methanol.

2.1.2 Recrystallization of Acetaminophen (via liquid anti-solvent addition- LAS process)

A saturated solution of acetaminophen (Sigma Chemical Co.) in n-butanol was prepared. The solubility of acetaminophen in n-butanol was 74 mg/ml. A schematic of the apparatus used in this investigation is illustrated in Figure 2.2.1. A #2-Whatman filter was placed at the bottom reducing union of the jergusson gage supported with two stainless steel mesh screens (100 μ m 316SS) to prevent the filter from blowing out upon addition of high pressure CO₂. The CO₂ was added to the solution (the same procedure as the expansion study) and the timing started. The rate of CO₂ addition was measured by the rate of pressure rise in the Jergusson gage. All the experiments were done with CO₂ at room temperature in the surge tanks. The piping downstream of the bottom addition valve was not heated so considerable cooling occurred due to the Joule-Thompson effect. The temperature of the inlet piping was measured as 5°C. At the system pressure of 700 psi considerable

expansion of the solution occurred. At this pressure, liquid CO₂ was being added to the system. The addition of liquid CO₂ could be seen as a wave motion at the bottom of the Jerguson gage. These waves were created due to the density difference between liquid CO₂ and the solvent n-butanol (this applies to other solvents also). A light bulb was placed in the background that would shine through the Jerguson gage glass and allow viewing of crystals as they formed.

The crystals were formed at 700 psi and could be seen settling to the bottom of the Jerguson gage. The system was taken to 800 psi and then drained. The solution was drained via the drain valve (see Figure 2.1.1). The drain valve was heated to ensure no plugging of the valve occurred due to the formation of dry ice. The drain valve was opened to depressurize the system. However, the system pressure did not drop until all the liquid was drained from the system. The liquid was collected in the effluent collection flask and the gas passed to the vent via a wet test meter. Once draining was completed some of the n-butanol solution was left inside the Jerguson and on the crystals as entrainment. The crystals were washed and dried with CO₂ for 15 minutes. The top valve (see Figure 2.1.1) was opened to let the gas flow through the Jerguson and out to the vent via the bottom drain valve. A steady flow of 3 litres/min was maintained. The dry crystals were collected and weighed to determine process yield.

2.1.3 Recrystallization of acetaminophen via the GAS process

The procedure to recrystallize acetaminophen using this process was basically the same as above, except that now the CO₂ was preheated in the surge tanks to 120°F before being injected into the solvent. The downstream piping was also heated to minimize cooling due to the Joule-Thompson effect. CO₂ inlet temperature was measured at 85°F. The CO₂ could be seen bubbling through the solution as the pressure was raised to the desired limit. To further minimize cooling due to expansion encountered during initial start-up, the system was pressurized from the top up to 500 psi. CO₂ injected from the bottom of the jerguson would see a lower pressure differential, thus less cooling would occur.

CO₂ gas dissolved into the butanol solution at high pressures, expanding the solution approximately three times the initial volume and causing crystallization of acetaminophen. The threshold pressure for this process was 1000 psi. Acetaminophen crystals were first seen to appear at 1000 psi. The final system pressure was taken to 1100 psi. At this pressure, a crop of crystals was noticeable on the walls of the gage and the sight glass. The rate of gas injection up to 1100 psi was varied to see its effect on the CSD. The GAS process was also used on the aspirin/methanol and benzoic acid/methanol systems. Aspirin was successfully recrystallized, however, the process was unsuccessful in recrystallizing benzoic acid.

2.1.4 Analysis of particle size distribution

Particle size distribution was analysed using a PDI Elzone 80XY counter. The system was calibrated according to instructions and an orifice was chosen which would satisfactorily measure the size ranges of the crystals. Before analysis, the particles were spread on a microscope slide and a rough measurement of the size distribution was done. This was used to select the appropriate orifice.

The particles were suspended in a 1% saline saturated solution of acetaminophen (a 1% saline saturated solution of aspirin and benzoic acid was used during analysis of these compounds). They were sonicated in a sonic bath for at least 5 minutes to break up aggregates. The suspension was then analysed by the Elzone counter to give the crystal size distributions for each set of experiments.

2.1.5 Recrystallization of acetaminophen by evaporation (GAS prime)

Acetaminophen crystals were also produced using a spray drying technique. A solution saturated with acetaminophen in ethanol was pumped through the solvent pump (see Figure 2.1.1), and the flowrate was controlled by a micrometering valve, located in the solvent line to the Jerguson gage (see Figure 2.1.1), at 0.1 to 0.2 ml/min. The solution passed through an aerosol generator (Sonatek Co.) where it was atomized into an aerosol mist of ca. $18\mu\text{m}$ particle size. At the same time hot CO_2 at 138°C (280°F) was passed through the Jerguson at approximately 3 litres/min. The pressure in the Jerguson was maintained at 50 psig.

The crystals produced were collected on a silicon gel coated microscope slide, for observation. A sample was also collected on a millipore filter ($0.4\mu\text{m}$) by placing it at the exit of the heated drain valve. The sample was analysed to determine the crystal size distribution. Benzoic acid was also recrystallized using this technique.

2.1.6 Recrystallization of Aspirin via GAS prime

Aspirin was recrystallized from a solution of methanol. The saturation concentration of aspirin in methanol was 320 mg/ml. Aspirin crystals were also produced by crystallization from the liquid aerosol. High pressure CO_2 was mixed with the aerosol. The system was maintained at 900 psi. The temperature of the CO_2 was $150^\circ\text{F}/65^\circ\text{C}$. Aspirin crystals were collected and analysed as described above. Benzoic acid was also recrystallized from methanol using this process.

2.2 Results and Discussion

2.2.1 Expansion Study

The experimental results (see Figures 2.2.1 and 2.2.2) showed that for any given pressure an increase in temperature reduced the level of expansion of the n-butanol and methanol solutions. This was the expected outcome because solubility of a gas in a liquid decreases with temperature.

The maximum expansion of the solvent occurred at a temperature of 5°C and pressures above 700 psi. At this point, liquid CO_2 was being added to the solvent. This can be clearly seen from the phase diagram for CO_2 (Figure 2.2.3). At 5°C , the

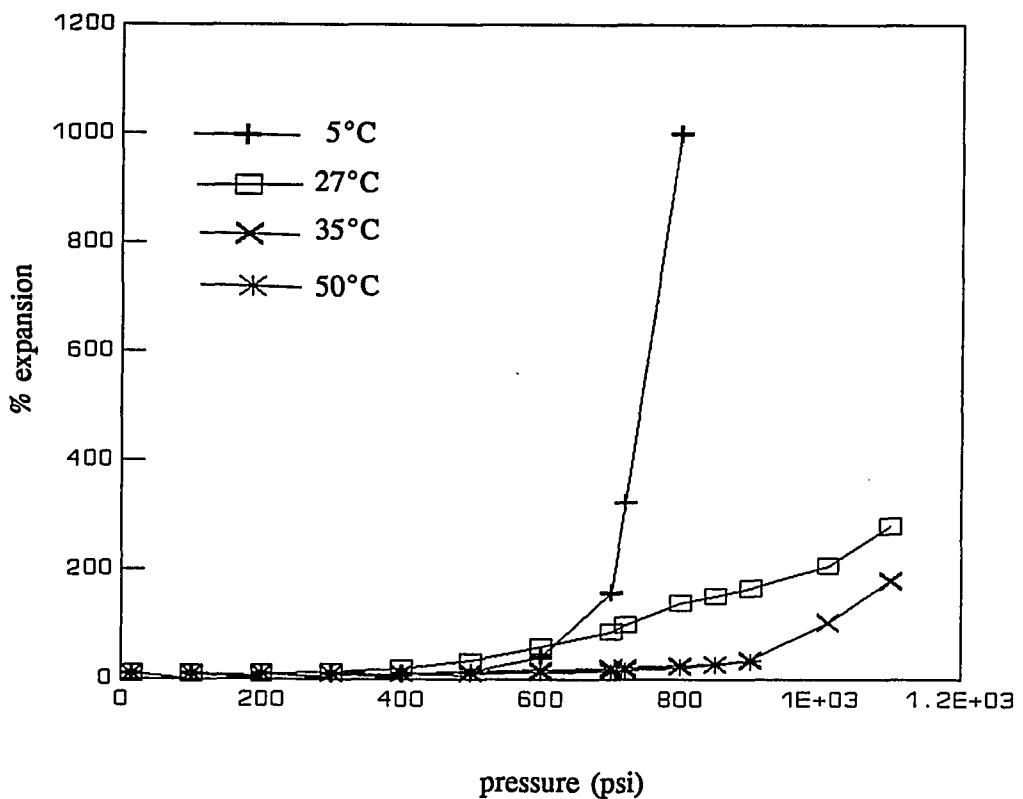


Figure 2.2.1 Butanol expansion by carbon-dioxide

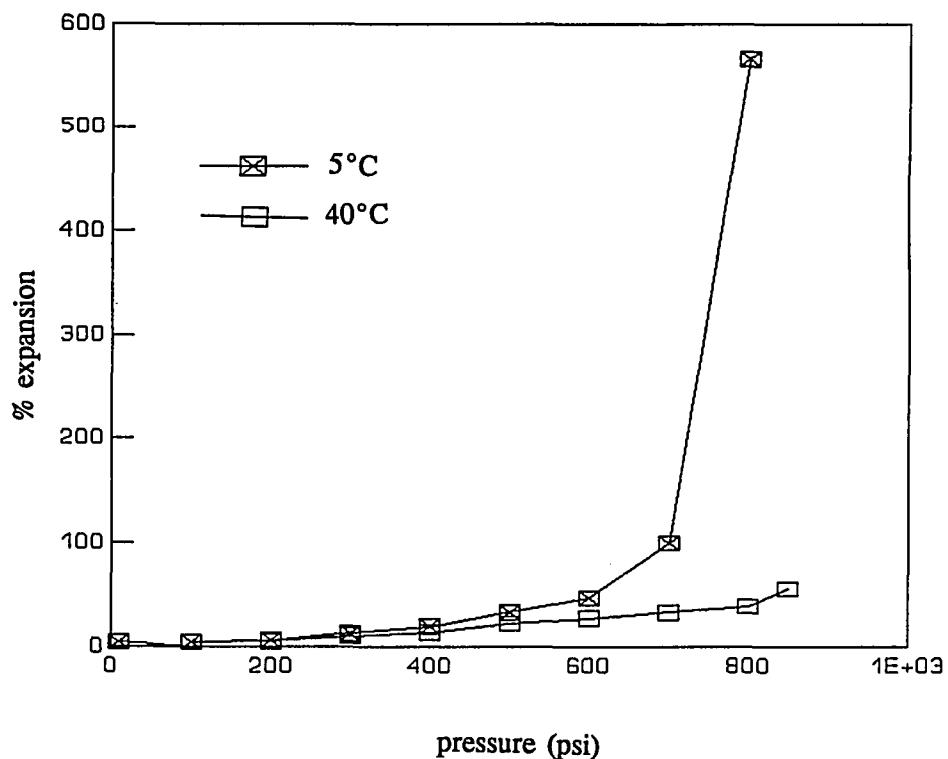


Figure 2.2.2 Methanol expansion by carbon dioxide

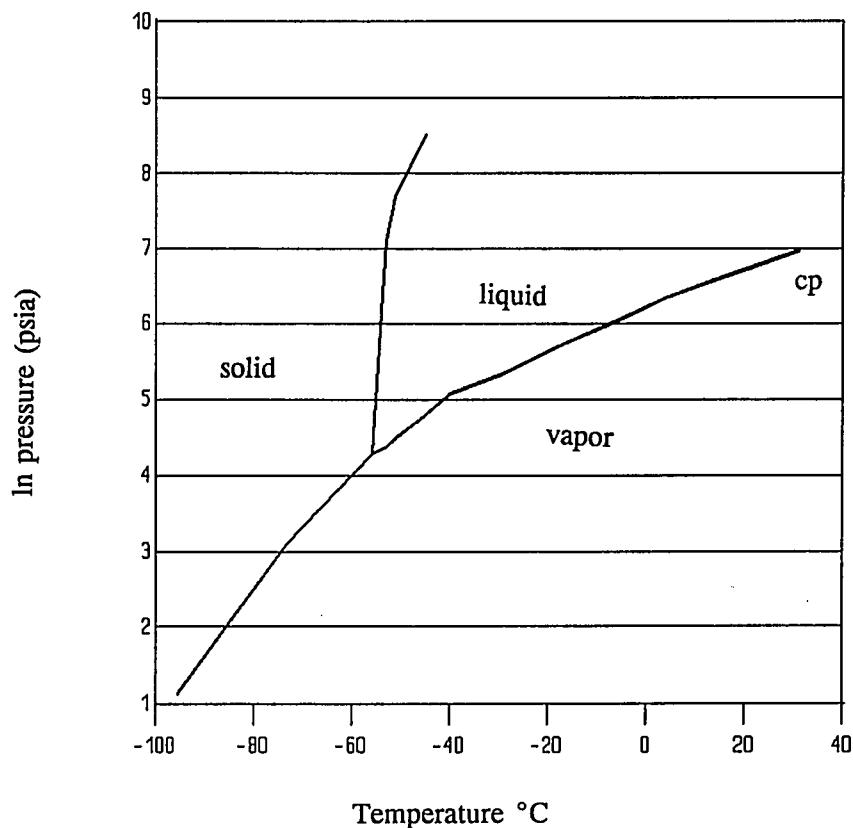


Figure 2.2.3 CO₂ Phase diagram

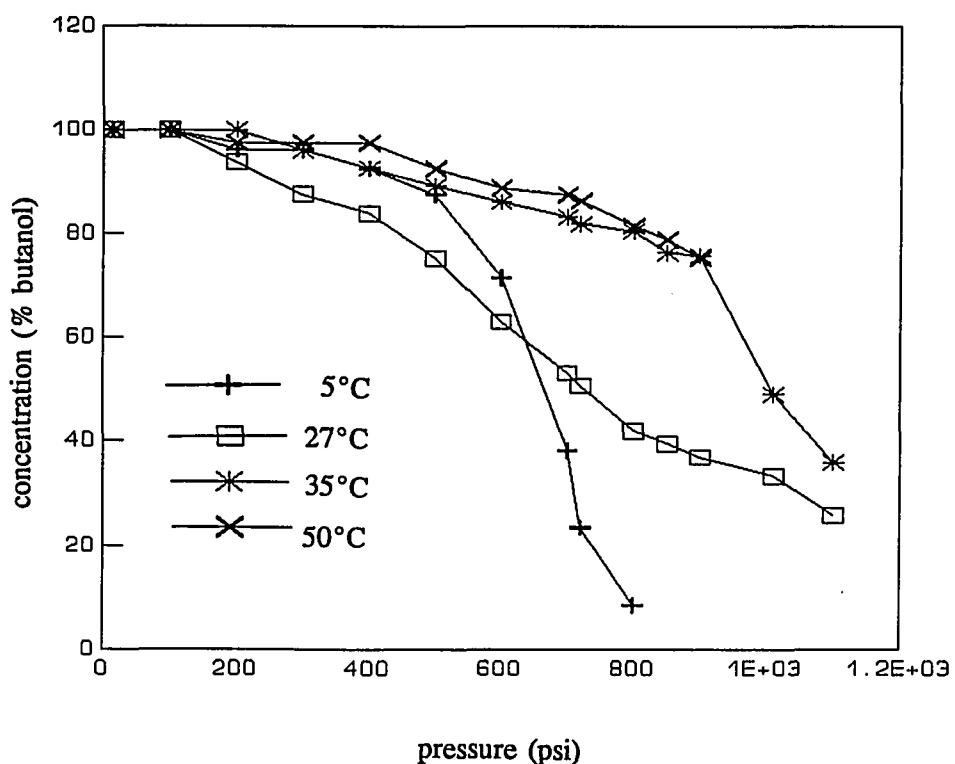


Figure 2.2.4 Butanol concentration inside jerguson vs pressure

liquefaction pressure is 600 psi. Since the system pressure was taken to 800 psi, liquid CO₂ was added to the solvent. However, no interface was seen and it was concluded that butanol was fully miscible with liquid CO₂. This was also observed by Francis (1954).

To ensure that liquid CO₂ was being added, the system was taken to 800 psi at 5°C without any solvent present. At 700 psi liquid CO₂ was seen entering the Jerguson gage. At 800 psi, the Jerguson gage was full of liquid CO₂.

As a result of the gas/liquid addition, the concentration of butanol decreases. The concentration drops from 100% butanol (atmospheric pressure) to lower values at higher pressures, as the solvent becomes diluted with CO₂ (see Figure 2.2.4 on previous page). The solubility of acetaminophen in the expanded solvent is lower, this causes crystallization. This is also known as "salting out".

2.2.2 Mass mean size distribution (LAS/GAS processes)

The mass mean size of each sample was calculated from the raw data obtained from the particle data counter, by the following equation:

$$L_{4,3} = \frac{\int_0^{\infty} L^4 n(L) dL}{\int_0^{\infty} L^3 n(L) dL} \quad 2.1$$

L = crystal size (μm)

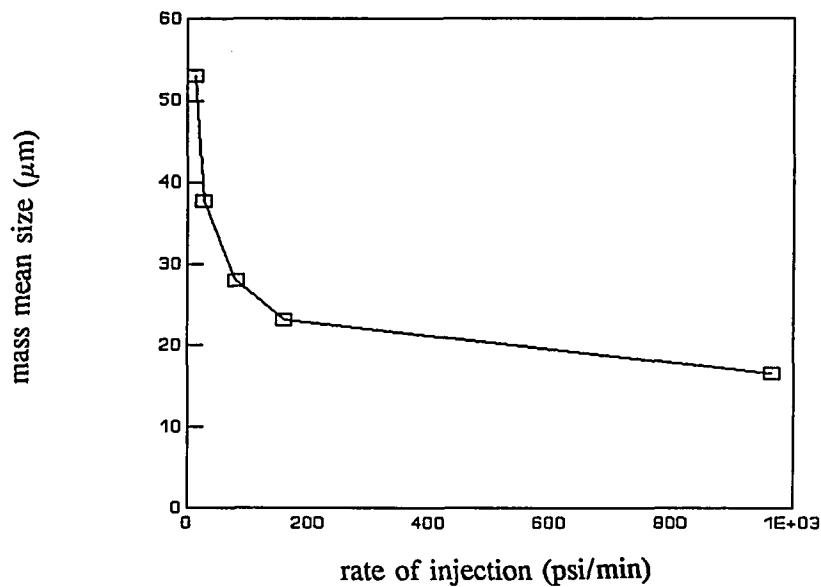


Figure 2.2.5 LAS process Mass Mean Size vs rate of injection

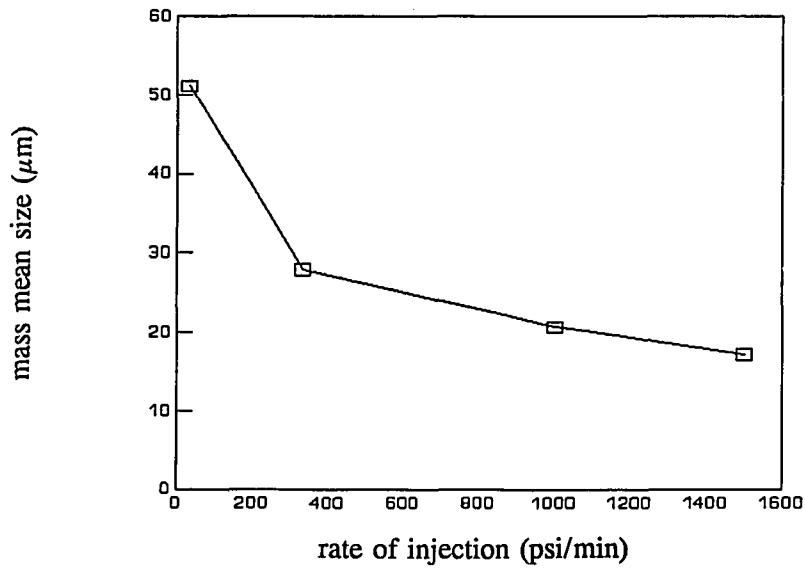


Figure 2.2.6 GAS process Mass Mean Size vs rate of injection

$n(L)$ = population density (#/ $\mu\text{m.cc}$)

The relationship between mass mean sizes and the rate of anti-solvent injection for the LAS and GAS processes is shown in Figures 2.2.5 and 2.2.6.

From the results shown in Figures 2.2.5 and 2.2.6, it can be concluded that the rate of injection of CO_2 affects the mass mean size of the crystals. Mass mean size is inversely proportional to the rate of injection of anti-solvent. The threshold pressure is defined as the pressure at which crystals can be seen inside the Jerguson gage. For the acetaminophen n-butanol system, this was 700 psi. Below this pressure no crystal formation was observed.

From Gibbs nucleation theory, the rate of formation of nuclei of critical size,

$$R_c = Z \exp\left(-\frac{\Delta G_{\max}}{RT}\right) \quad 2.2$$

Z = collision frequency (calculable from kinetic theory)

ΔG_{\max} = Gibbs free energy

$$\Delta G_{\max} = \frac{B}{((RT)^2 \ln^2 S)} \quad 2.3$$

B = constant (dependent on physical properties of the system)

S = supersaturation ratio (defined as the ratio of the actual concentration of solute in

solution to its saturation concentration)

Hence the nucleation rate is a function of the supersaturation ratio.

Substituting for ΔG_{\max} in the first equation gives the following relationship of nucleation rate with supersaturation ratio.

$$R_c = \frac{Z}{\exp\left(\frac{B}{(RT)^3 \ln^2 S}\right)} \quad 2.4$$

This equation applies strictly to homogeneous nucleation of vapor to liquid droplets, but the relationship between nucleation and supersaturation ratio is probably true for liquid systems. As S increases, the exponential term decreases, hence the nucleation rate also increases. Therefore, high supersaturation ratios produce high nucleation rates.

Supersaturation is an unstable condition (although some systems can be metastable) and the system tries to relieve supersaturation by either diffusional growth or nucleation mechanisms. At low supersaturation i.e. 700 psi (for acetaminophen/butanol system) little nucleation occurs. When the system is left at this condition, diffusional growth becomes the dominating mechanism. Fewer new crystals are produced, but the existing ones grow, thus reducing the supersaturation. Crystals will continue to grow as long as this condition is maintained. This can be seen by the results of the 30 min holding time and 60 min holding time runs (see

Table 2.2.1). The supersaturation is controlled by anti-solvent addition. Long residence times of CO₂ at the threshold pressure (700 psi) gives low supersaturation, creating larger particles.

| system | time | P(psi) | time | P(psi) | holding time | L _{4,3} μm |
|--------|-------|--------|--------|--------|--------------|---------------------|
| A/B | 1 min | 700 | 30 min | 750 | 30 min | 38.6 |
| A/B | 1 min | 700 | 30 min | 750 | 30 min | 37.7 |
| A/B | 1 min | 700 | - | - | 60 min | 58.2 |
| A/B | 1 min | 700 | - | - | 60 min | 53.1 |

A/B = Acetaminophen/Butanol

Table 2.2.1: Mass mean size dependence with holding time (LAS process)

A fast rate of injection of CO₂ above 700 psi creates high supersaturation ratios, hence nucleation is the dominant mechanism and less diffusional growth occurs, as a result smaller particles were produced. This can be seen from the experiments with injection rates of 50 seconds up to 800 psi, which corresponds to an injection rate of 960 psi/min (see fig 2.2.6).

Below the critical supersaturation level, the system is stable so no crystallization occurs. Consequently, the rate of addition of CO₂ up to the threshold pressure does not affect the crystal size. This can be seen from the experiments

where the injection time up to 700 psi was varied, but maintained constant after 700 psi (see table 2.2.2).

| system | Time | Pressure (psi) | Time | Pressure (psi) | $L_{4,3}$ (μm) |
|--------|--------|-------------------|--------|-------------------|--------------------------------|
| A/B | 10 min | 700 | 10 min | 800 | 28.5 |
| A/B | 10 min | 700 | 10 min | 800 | 28.0 |
| A/B | 30 min | 700 | 10 min | 800 | 25.4 |
| A/B | 30 min | 700 | 10 min | 800 | 27.8 |

A/B = Acetaminophen/Butanol

Table 2.2.2: Effect of rate of injection up to threshold pressure on mass mean size

An injection time of 5 minutes produced larger crystals than the 50 second injection time. The maximum supersaturation ratio (expansion) attainable by the equipment was reached at a slower rate than for the 5 minute injection, so comparatively, more growth occurred (see Figures 2.2.5 and 2.2.6), giving rise to larger particles.

In the GAS process the critical supersaturation was reached at 1000 psi (32°C). At this condition CO_2 is near its critical point ($T_c=31.1^\circ\text{C}$, $P_c=1070.6 \text{ psia}$). The rate of generation of supersaturation was again shown to be the critical factor in the size manipulation. Higher rates of injection up to the maximum pressure of 1100 psi produced smaller crystals (see Figure 2.2.5). However, for aspirin the critical

supersaturation was at a pressure of 800 psi. The system temperature was maintained at 22°C. GAS injections at higher temperatures (32°C) failed to produce crystals. The system was taken to 1100 psi, expansion did occur but no crystals formed. The solubility of aspirin in methanol is a strong function of temperature. At room temperature, the solubility is 320 mg/ml methanol. However, at 35°C it increases to 400 mg/ml. Therefore, the temperature increase will make the solution undersaturated. This may be happening when warm CO₂ was injected in the solution. Although expansion was occurring due to the dissolution of the gas in the solvent, it was not enough to overcome the undersaturation caused by the temperature rise. Consequently, in some systems the temperature effect on solubility may need to be taken into account when using the GAS process. Aspirin was successfully recrystallized by the LAS process, since this operated at much lower temperatures (5°C). Recrystallization of benzoic acid was unsuccessful with both LAS and GAS processes. It is possible that this system might be metastable with respect to these processes.

2.2.3 Mass mean size distribution (GAS prime process)

The GAS prime process produced crystals in a mass mean size range much smaller than the LAS or GAS processes. This was the expected result because the solvent aerosol is essentially monodisperse at 18 μm . Consequently, evaporation of the aerosol will generate crystals smaller than 18 μm (see Table 2.2.3). Also, the

coefficient of variation of the CSD produced by this process was relatively narrow.

This is discussed further in the crystal size distribution section on page 44.

| system | Pressure (psi) | Temp (°C) | C.V | $L_{4,3} \mu\text{m}$ |
|----------|----------------|-----------|------|-----------------------|
| BA/MeOH | 900 | 71 | 0.50 | 15.9 |
| BA/MeOH | 50 | 71 | 0.43 | 13.7 |
| A/EtOH | 50 | 110 | 0.40 | 11.2 |
| A/EtOH | 50 | 138 | 0.32 | 9.7 |
| ASP/MeOH | 900 | 66 | 0.40 | 11.6 |

A/EtOH = Acetaminophen/Ethanol ASP/MeOH = Aspirin/Methanol

BA/MeOH = Benzoic acid/Methanol

Table 2.2.3 : Mass mean sizes of crystals produced from atomized solvent.

2.2.4 Morphology

Particle morphology was not constant. Crystals of various shapes and sizes were formed. Acetaminophen crystals recrystallized from the LAS/GAS processes were polymorphic (see Figure 2.2.8). The original acetaminophen crystals were also polymorphic (see Figure 2.2.7) Recrystallization using these two processes succeeded

in manipulating the size of the crystals, but not their morphology. Aspirin recrystallized from methanol via LAS/GAS processes was predominantly needle shaped (See Figures 2.2.9 and 2.2.10). Aspirin, in general, tends to form needle shaped crystals more readily than any other shape. The low pressure GAS prime process also produced needle shaped crystals (see Figure 2.2.13). Needle shaped crystals cannot be analyzed by the Particle data counter or sieve, hence a mass mean size could not be obtained.

Crystals of uniform morphology were formed by crystallization from the aerosol phase (GAS prime). The aerosol generated was essentially monodisperse at $18\mu\text{m}$. For the formation of acetaminophen crystals, the evaporation rate was constant, therefore similar crystals were produced (see Figure 2.2.11). Original acetaminophen crystals were polymorphic (see Figure 2.2.7). High pressure recrystallization of Aspirin produced monodisperse crystals (see Figure 2.2.12) because at high pressures (900 psi) aspirin is slightly soluble in CO_2 , but insoluble at atmospheric pressure. As the mixture was expanded through the drain valve, high supersaturation ratios were created instantaneously, resulting in formation of smaller monodisperse particles. Benzoic acid recrystallized from high pressure also produced uniform size crystals, but of varied morphology (see Figure 2.2.14). Benzoic acid recrystallized from evaporation of the aerosol at low pressure was of uniform morphology (see Figure 2.2.15). However, the mass mean size was higher compared to acetaminophen crystals.

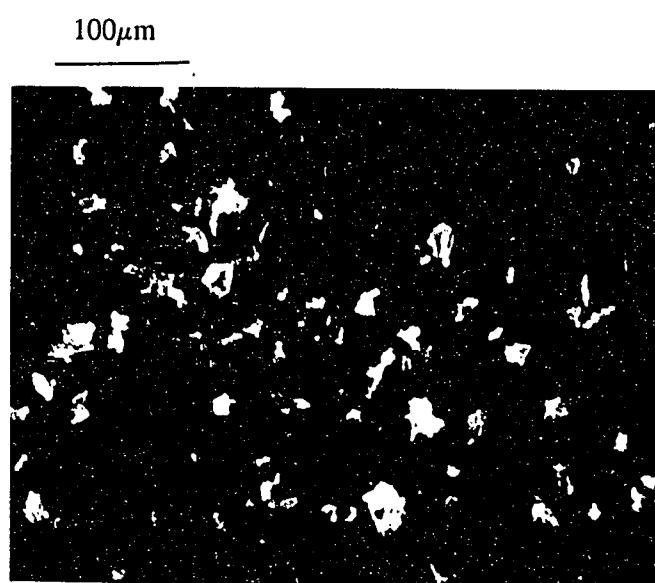


Figure 2.2.7: Acetaminophen-Original crystals

100 μ m

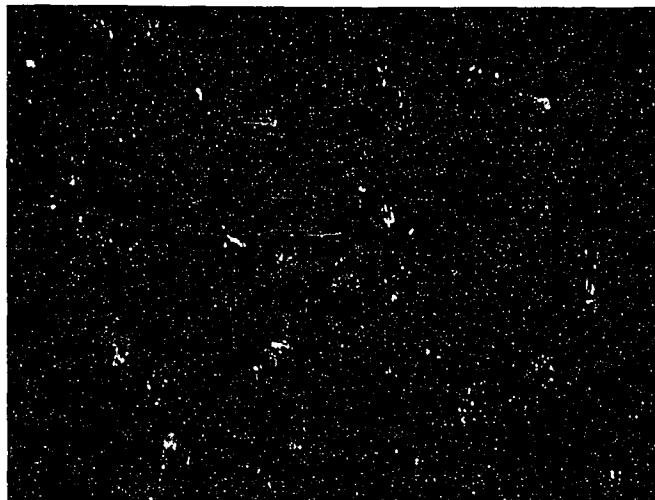


Figure 2.2.8: Acetaminophen crystals (LAS PROCESS)

300 μ m

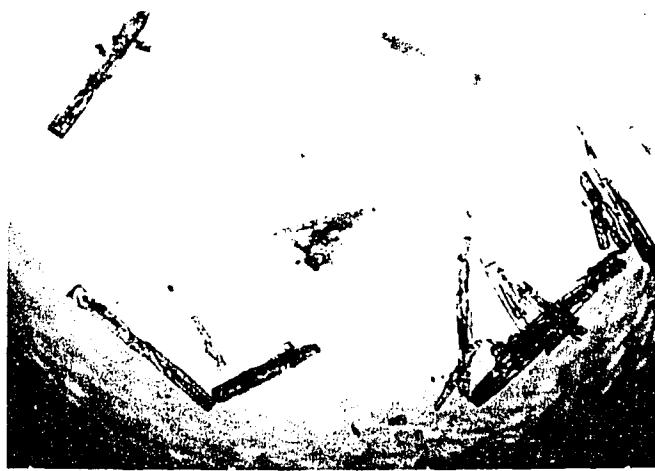


Figure 2.2.9: Aspirin crystals (LAS PROCESS)

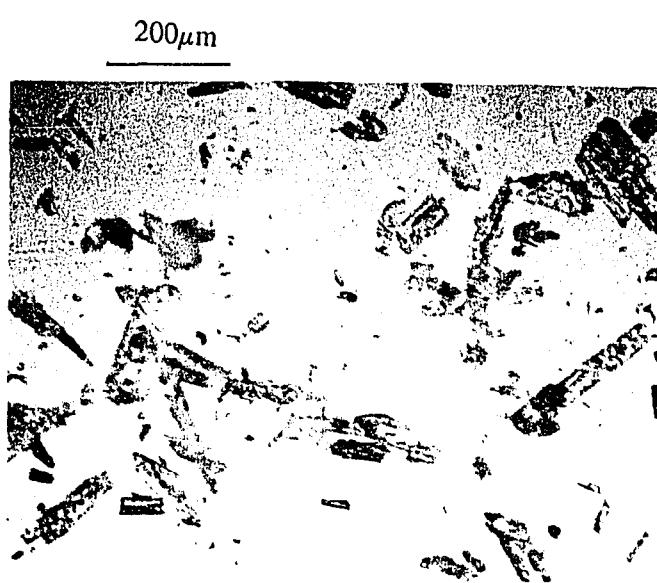


Figure 2.2.10: Aspirin crystals (GAS PROCESS)

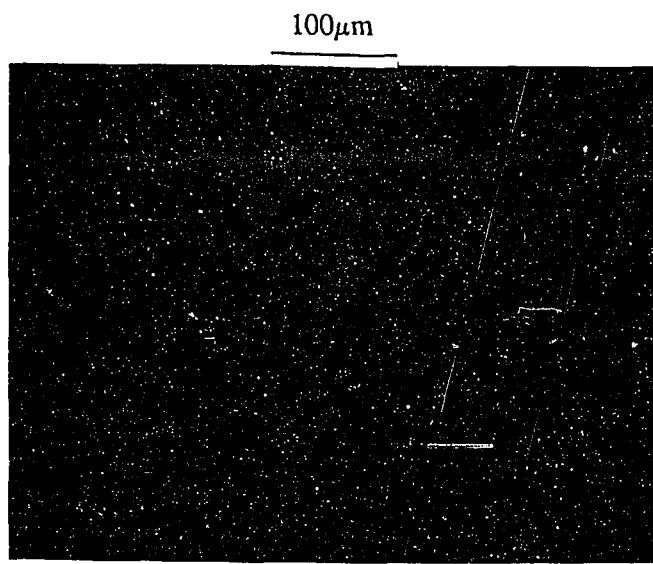


Figure 2.2.11: Acetaminophen crystals (GAS PRIME)

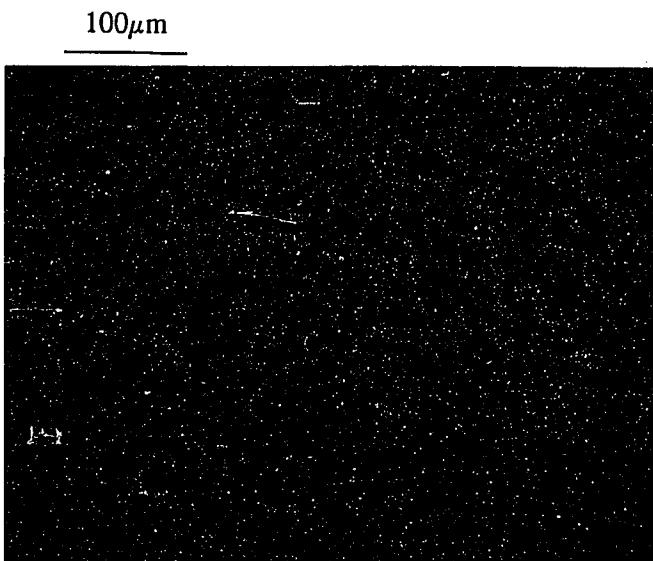


Figure 2.2.12: Aspirin crystals 900 psi (GAS PRIME)

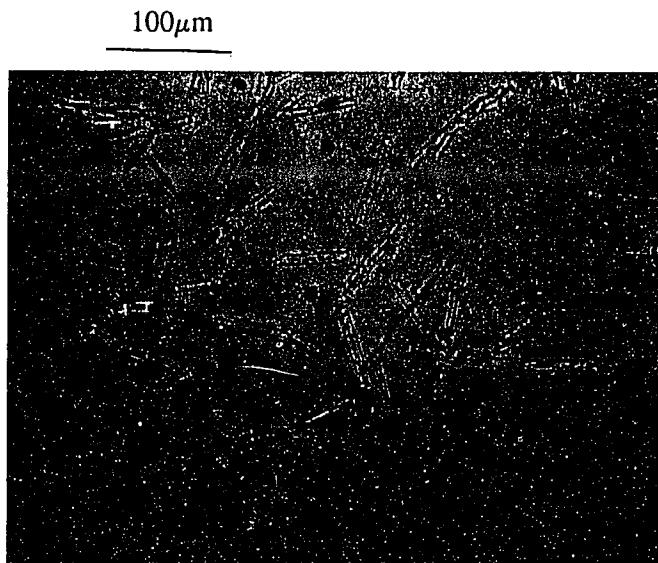


Figure 2.2.13: Aspirin crystals 50 psi (GAS PRIME)

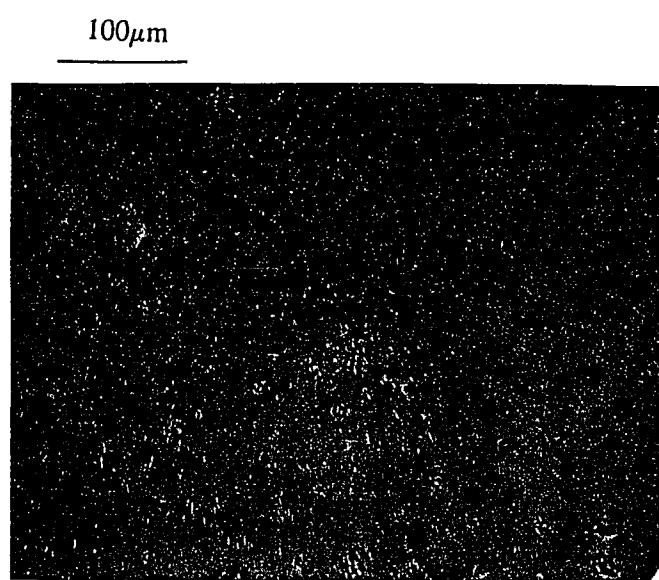


Figure 2.2.14: Benzoic acid crystals 900 psi (GAS PRIME)

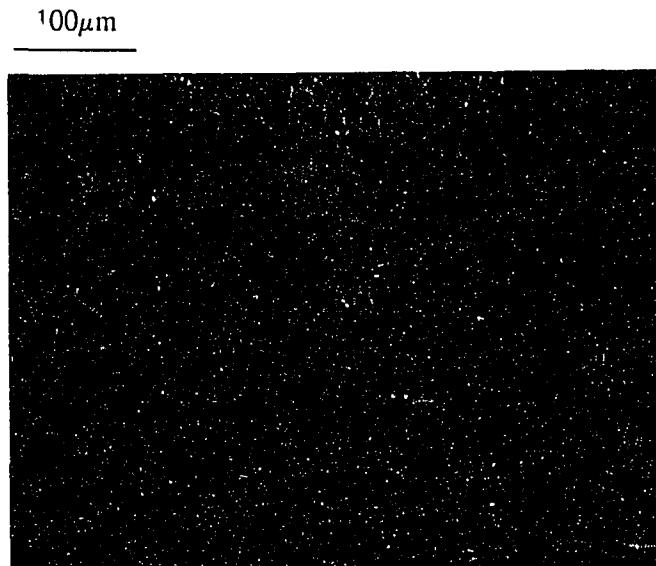


Figure 2.2.15: Benzoic acid crystals 50 psi (GAS PRIME)

2.2.5 Crystal size distribution (coefficient of variation-CV)

The population density plots for these experiments are given in the appendix. The CV of the CSD of particles produced by higher injection rates for the GAS and LAS processes was narrower (see Figures 2.2.16 and 2.2.17). High anti-solvent injection rate promotes nucleation and inhibits growth. Consequently, the CSD is clustered in the small size range giving a narrow coefficient of variation. GAS prime process also produced CSD with a relatively narrow coefficient of variation (see Table 2.2.2). This technique also promotes nucleation and inhibits growth, hence produces a smaller mass mean size with a narrow distribution.

Coefficient of variation ($C.V_{pop}$) is defined as

$$C.V_{pop} = \left(\frac{m_0 m_2}{m_1^2} - 1 \right)^{1/2} \quad 2.5$$

$$m_0 = \int_0^{\infty} n(L) dL \quad 2.6$$

$$m_1 = \int_0^{\infty} L n(L) dL \quad 2.7$$

$$m_2 = \int_0^{\infty} L^2 n(L) dL \quad 2.8$$

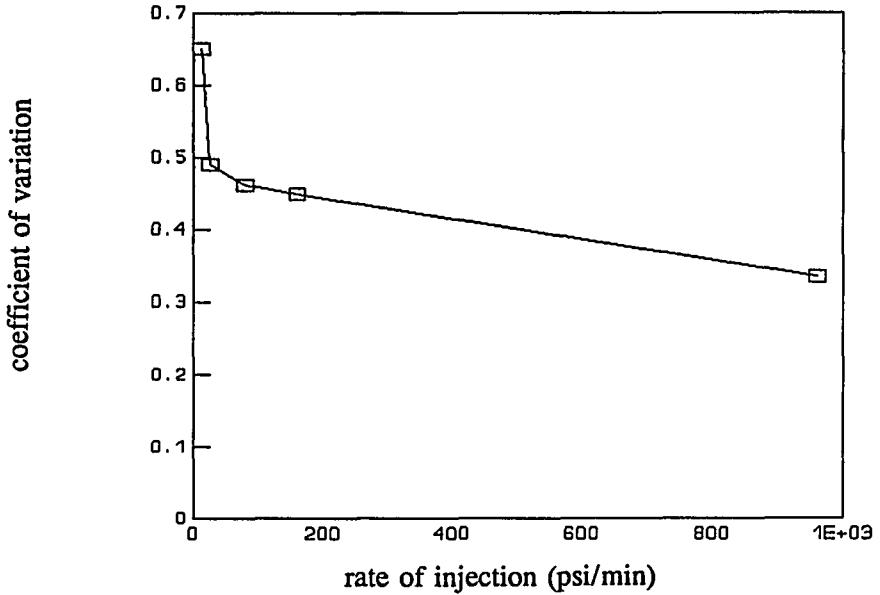


Figure 2.2.16 Coefficient of variation vs rate of injection: LAS process

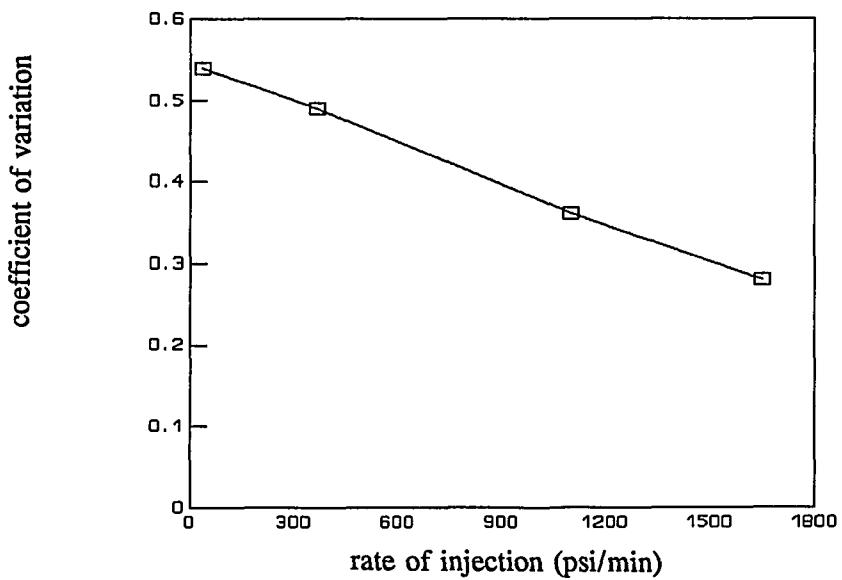


Figure 2.2.17 Coefficient of variation vs rate of injection: GAS process

CHAPTER 3

CONCLUSIONS AND RECOMMENDATIONS

Acetaminophen and aspirin were successfully recrystallized from n-butanol and methanol respectively using the following processes:

- Liquid anti-solvent (LAS) Batch mode
- Gas anti-solvent (GAS) Batch mode
- GAS prime Continuous

Benzoic acid was recrystallized by GAS prime only.

- The mass mean size range for GAS/LAS processes was from 16.6 to 58.2 μm .
- The mass mean size range for the GAS prime process was from 9.7 to 15.9 μm .

All compounds were successfully recrystallized using this process.

- Rate of injection of CO₂ was the key parameter in the size manipulation of acetaminophen crystals via the LAS/GAS processes.
- High rates of CO₂ injection after the threshold pressure produced smaller crystals with a narrow coefficient of variation
- Long holding time at the threshold pressure produced larger crystals with a wider coefficient of variation
- Crystals formed by the LAS/GAS processes were polymorphic.
- Crystals formed by the GAS prime process were monodisperse and had uniform morphology.

The GAS process is widely applicable for the comminution of compounds

insoluble in supercritical fluids. The following criteria need to be satisfied :

- the solute of interest must be soluble to a high level (several mg/ml) in a solvent
- the solvent must "expand" upon injection of a high pressure anti-solvent i.e the chosen gas must be soluble in the solvent
- the solute of interest must be insoluble in the anti-solvent

The possibility of using the GAS process as a means of fractionally crystallizing a mixture of compounds, although this was not investigated, is perhaps the most promising area. This needs to be explored further. The GAS process has proven to be applicable in the comminution of compounds. If its applicability can be extended to separation of mixtures then it is likely to become a viable multi-purpose commercial process for recrystallizing compounds.

The GAS prime process is of potential importance because it can generate monodisperse crystals of uniform morphology of compounds that may be difficult to dissolve in supercritical CO₂. Since most polar and many non-polar compounds are insoluble in supercritical CO₂, techniques like the RESS process will not work. The GAS prime process might be the only viable alternative.

APPENDIX A: Population Density Plots

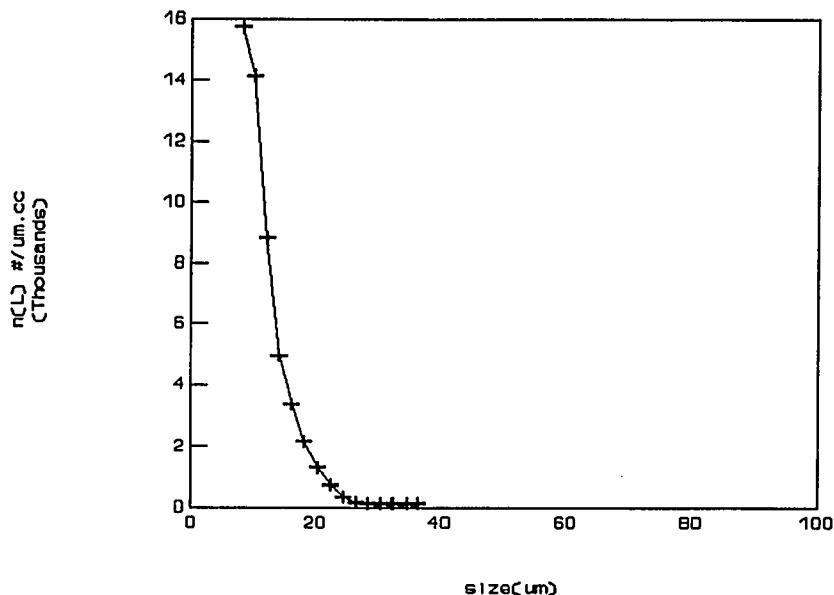


Figure A1 50 sec injection to 800 psi(LAS process)

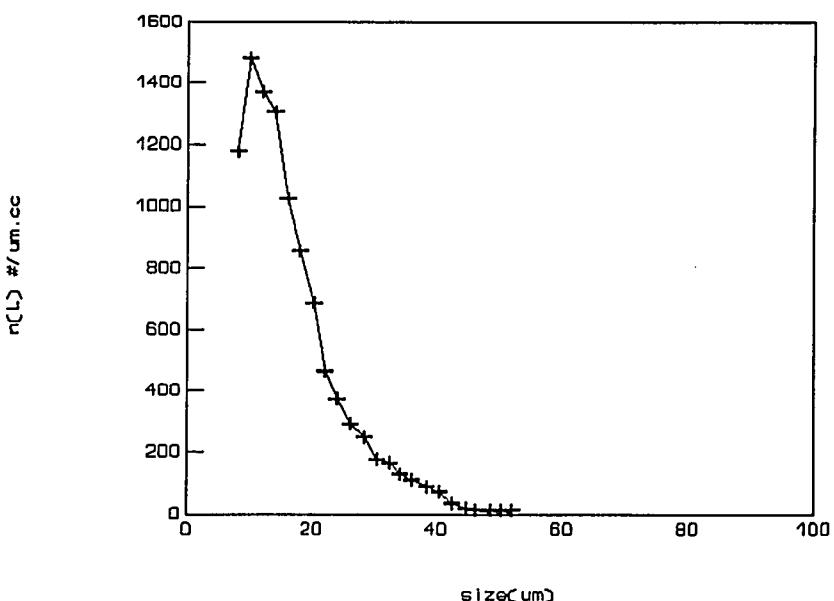


Figure A2 10 min to 700 psi (LAS process)

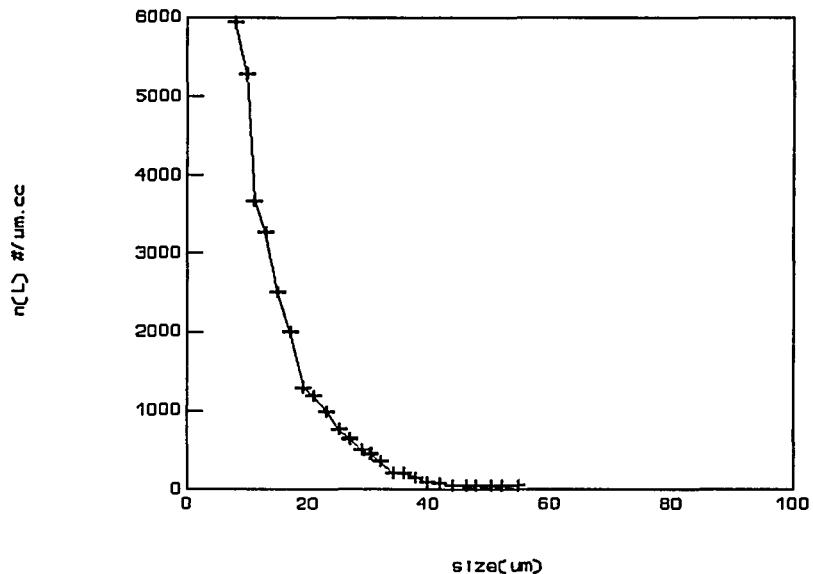


Figure A3 30 min to 700 psi (LAS process)

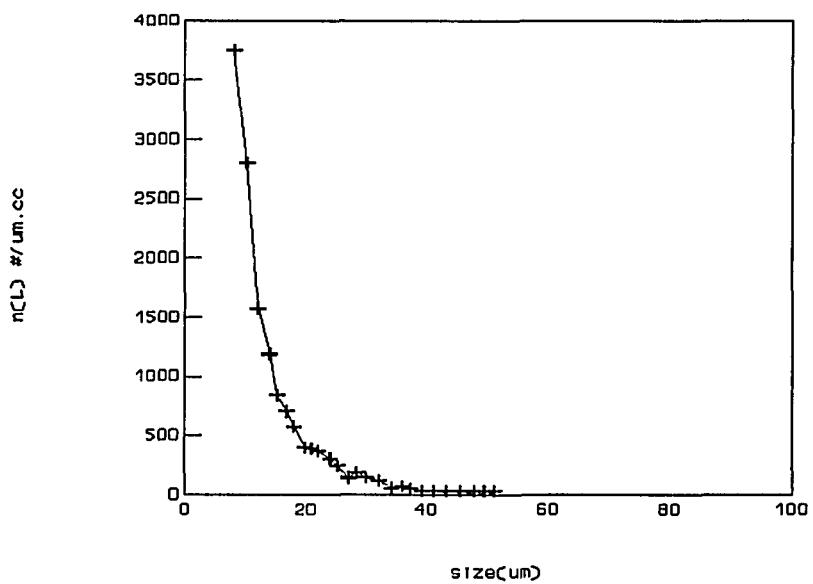


Figure A4 5 min to 800 psi (LAS process)

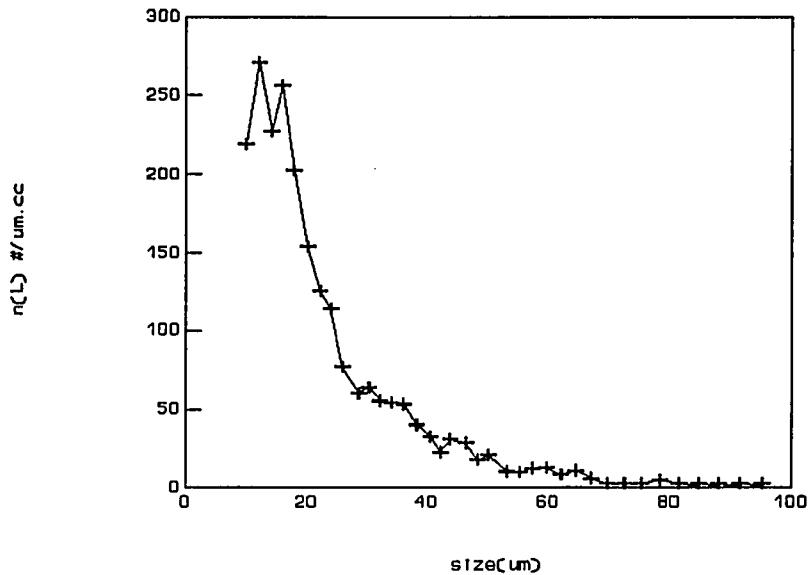


Figure A5 60 minute holding time (LAS process)

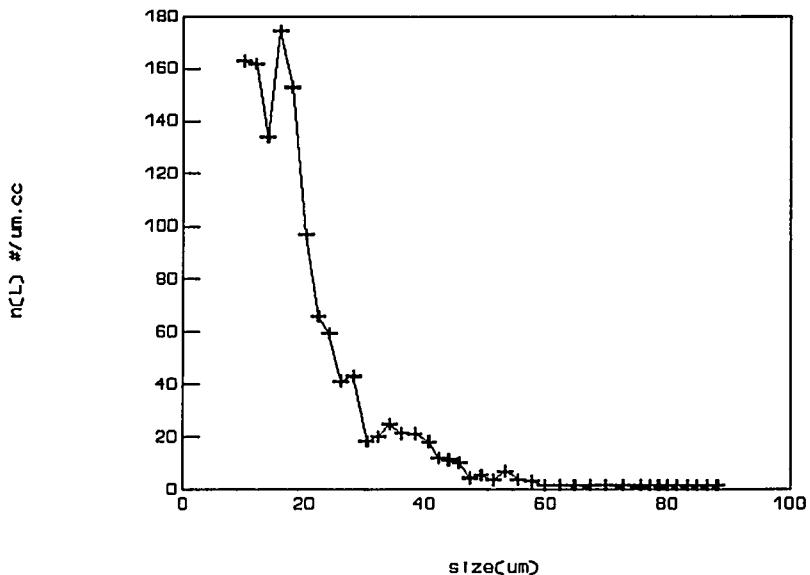


Figure A6 30 minute holding time (LAS process)

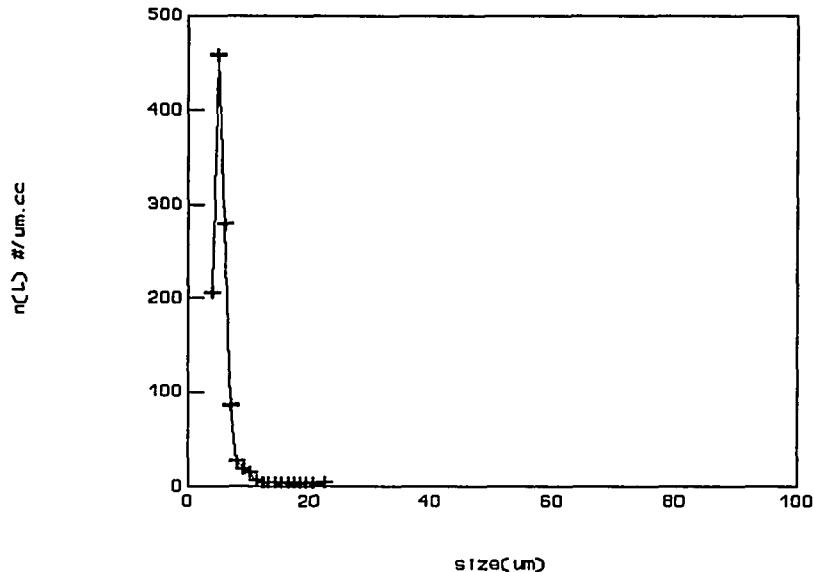


Figure A7 Acetaminophen-Ethanol (GAS prime)

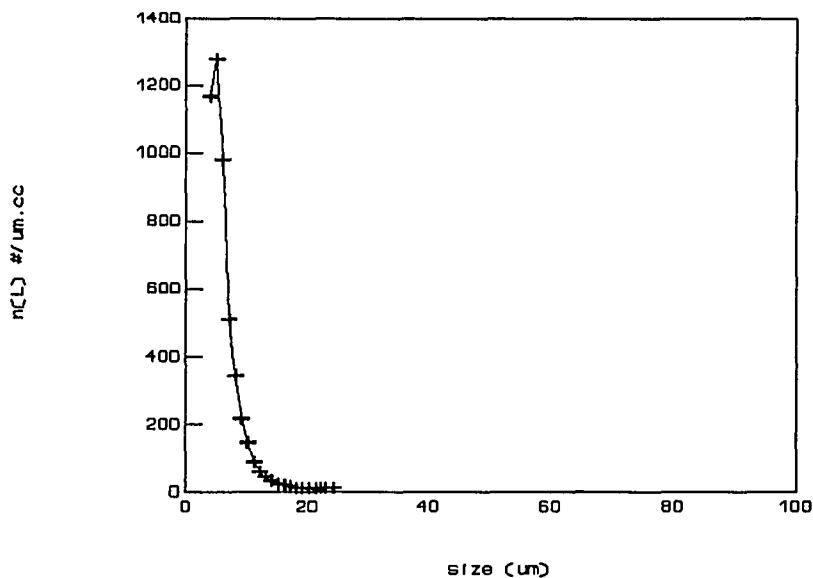


Figure A8 Aspirin-Methanol (GAS prime)

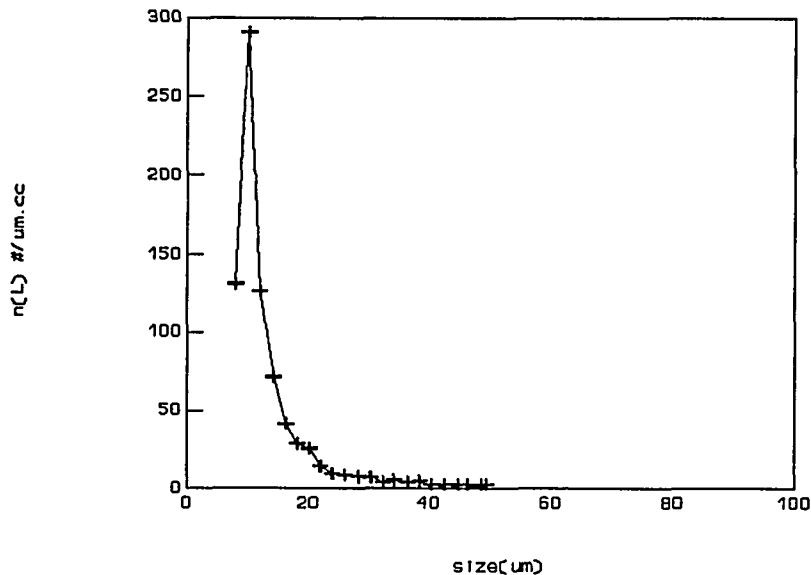


Figure A9 3 min to 1100 psi (GAS process)

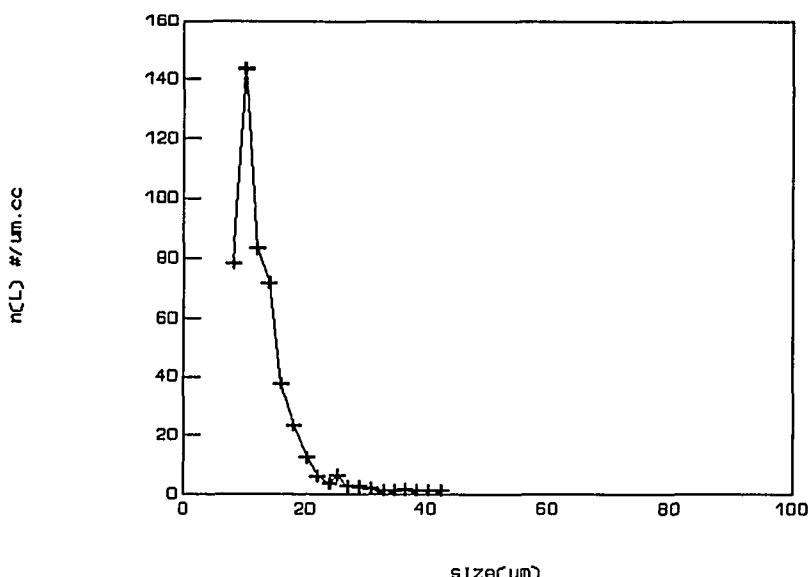


Figure A10 1 min to 1100 psi (GAS process)

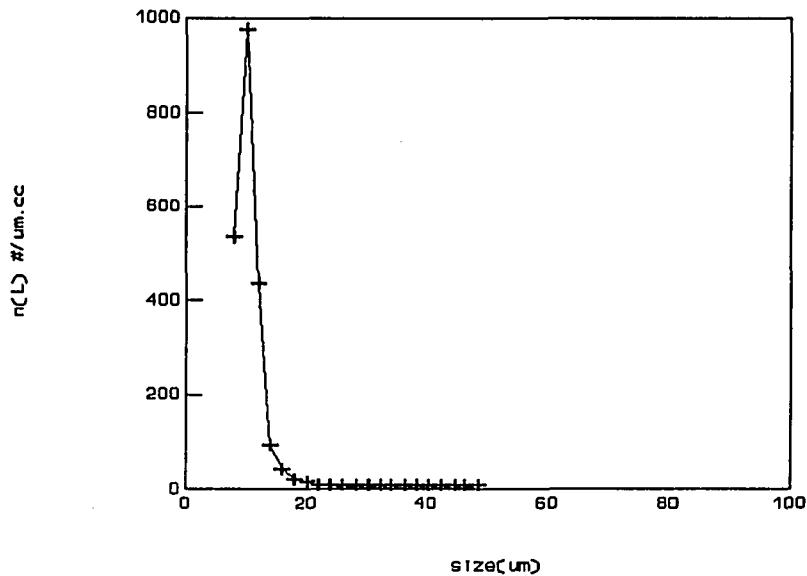


Figure A11 40 sec to 1100 psi(GAS process)

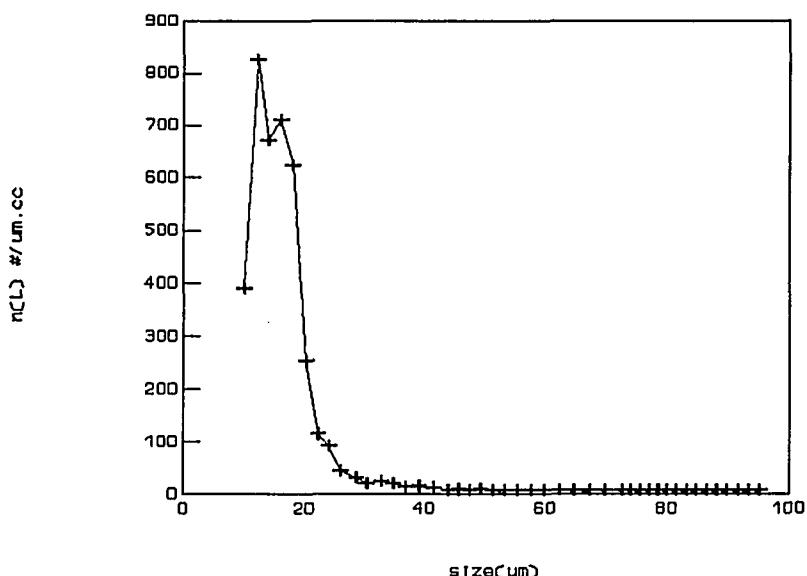


Figure A12 30 min holding time at 1000 psi (GAS process)

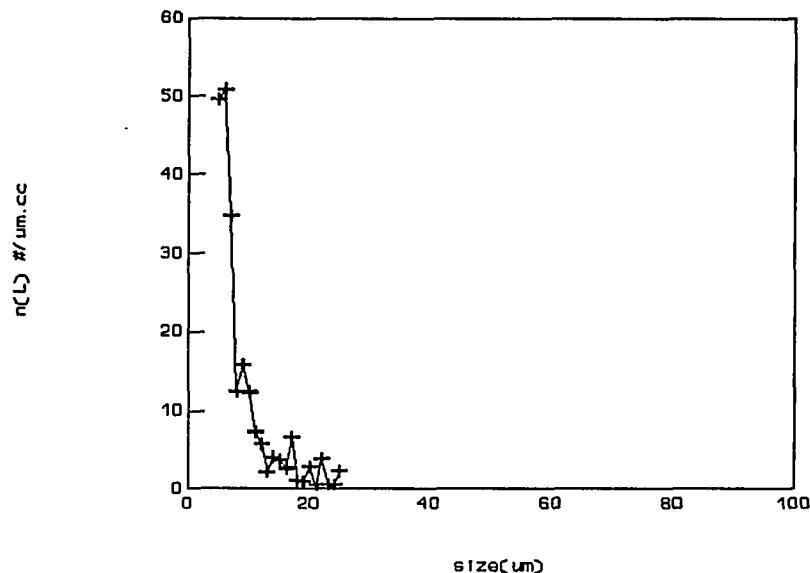


Figure A13 Benzoic Acid 50 psi (GAS prime)

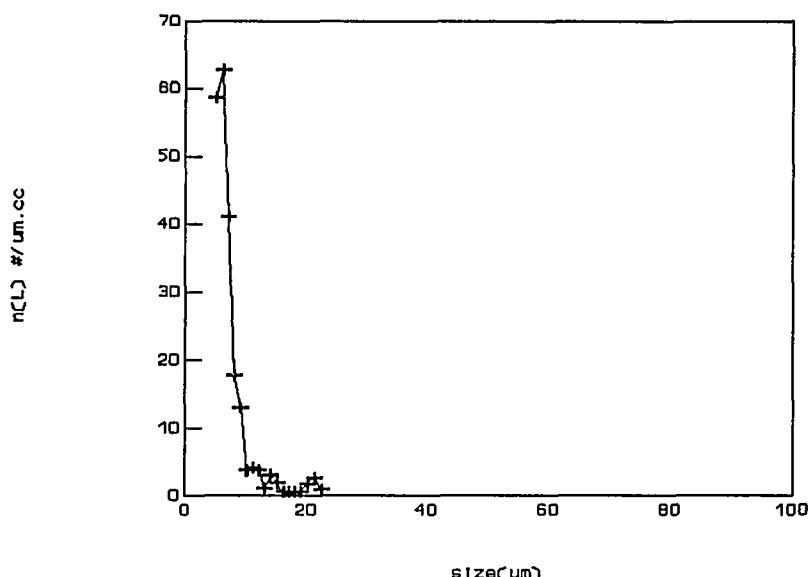


Figure A14 Benzoic Acid 900 psi(GAS prime)

APPENDIX B: PDI counter data

| system | time | P(psi) | time | P(psi) | holding time | $L_{4,3} \mu\text{m}$ | C.V | Repro |
|--------|--------|--------|--------|--------|--------------|-----------------------|------|-------|
| A/B | 50 s | 800 | - | - | - | 18.1 | 0.35 | |
| A/B | 50 s | 800 | - | - | - | 16.3 | 0.32 | 9% |
| A/B | 5 min | 800 | - | - | - | 26.7 | 0.49 | |
| A/B | 5 min | 800 | - | - | - | 23.2 | 0.45 | 13% |
| A/B | 10 min | 700 | 10 min | 800 | - | 28.5 | 0.48 | |
| A/B | 10 min | 700 | 10 min | 800 | - | 28.1 | 0.45 | 2% |
| A/B | 30 min | 700 | 10 min | 800 | - | 25.4 | 0.46 | |
| A/B | 30 min | 700 | 10 min | 800 | - | 27.8 | 0.49 | 9% |
| A/B | 1 min | 700 | 30 min | 750 | 30 min | 38.6 | 0.47 | |
| A/B | 1 min | 700 | 30 min | 750 | 30 min | 37.7 | 0.51 | 2% |
| A/B | 1 min | 700 | - | - | 60 min | 58.2 | 0.70 | |
| A/B | 1 min | 700 | - | - | 60 min | 53.1 | 0.60 | 9% |

A/B = Acetaminophen/n-butanol Repro = Reproducibility

Acetaminophen original crystals $L_{4,3} = 20.8 \mu\text{m}$

Table B1 Mass mean sizes of acetaminophen - LAS PROCESS

| System | Time | P(psi) | T(°C) | holding time(min) | C.V | $L_{4,3} \mu\text{m}$ |
|--------|--------|--------|-------|----------------------|------|-----------------------|
| Asp/M | 30min | 800 | 22 | 10 | | n/a |
| A/B | 40 sec | 1100 | 32 | - | 0.28 | 17.1 |
| A/B | 1 min | 1100 | 32 | - | 0.36 | 20.7 |
| A/B | 3 min | 1100 | 32 | - | 0.49 | 27.9 |
| A/B | 1 min | 1000 | 32 | 30 | 0.54 | 51.1 |

A/B = Acetaminophen/Butanol

Asp/M = Aspirin/Methanol

Table B2: Mass mean sizes of acetaminophen crystals-GAS PROCESS.

mass mean=20.8428 μ m Acetaminophen Original Crystals

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $Ln(L)dL$ | $L^2n(L)dL$ |
|-------|----------|----------|-------------|-------------|-----------|-------------|
| 22185 | 8.01 | 14041.13 | 11401368 | 91324961 | 177701.7 | 1423391 |
| 28135 | 10.14 | 13208.92 | 29333290 | 3E+08 | 285288.9 | 2892829 |
| 16369 | 12.2 | 7946.116 | 29723615 | 3.6E+08 | 199701.8 | 2436362 |
| 11009 | 14.2 | 5504.5 | 31521937 | 4.5E+08 | 156327.8 | 2219855 |
| 7394 | 16.25 | 3606.829 | 31727769 | 5.2E+08 | 120152.5 | 1952478 |
| 4712 | 18.28 | 2321.182 | 28782854 | 5.3E+08 | 86135.35 | 1574554 |
| 2290 | 20.23 | 1174.358 | 18959336 | 3.8E+08 | 46326.66 | 937188.4 |
| 1751 | 22.01 | 983.7078 | 18670084 | 4.1E+08 | 38539.51 | 848254.6 |
| 1301 | 23.95 | 670.6185 | 17872851 | 4.3E+08 | 31158.95 | 746256.8 |
| 890 | 26.05 | 423.8095 | 15733059 | 4.1E+08 | 23184.5 | 603956.2 |
| 598 | 28.34 | 261.1353 | 13611334 | 3.9E+08 | 16947.32 | 480286.9 |
| 325 | 30.32 | 164.1414 | 9058805 | 2.7E+08 | 9853.999 | 298773.3 |
| 223 | 32.98 | 83.83458 | 7999389 | 2.6E+08 | 7354.539 | 242552.7 |
| 154 | 35.29 | 66.66666 | 6768239 | 2.4E+08 | 5434.659 | 191789.1 |
| 128 | 37.75 | 52.03252 | 6885902 | 2.6E+08 | 4832 | 182408 |
| 65 | 39.71 | 33.16326 | 4070174 | 1.6E+08 | 2581.15 | 102497.5 |
| 66 | 41.76 | 32.19512 | 4806460 | 2E+08 | 2756.16 | 115097.2 |
| 46 | 43.93 | 21.19815 | 3899791 | 1.7E+08 | 2020.779 | 88772.84 |
| 31 | 46.21 | 13.59649 | 3058930 | 1.4E+08 | 1432.51 | 66196.28 |
| 13 | 48.61 | 5.416666 | 1493207 | 72584825 | 631.9299 | 30718.11 |
| 19 | 51.13 | 7.539682 | 2539691 | 1.3E+08 | 971.4699 | 49671.26 |
| 7 | 53.78 | 2.641509 | 1088830 | 58557325 | 376.4599 | 20246.02 |
| sum = | 97711 | | 3E+08 | 6.2E+09 | 1219711 | 17504134 |
| m0 | | | | | m1 | m2 |
| C.V = | 0.386863 | | | | | |

MS#30.dat

mass mean=18.10921 μ m

| N | L | dN/dL | n(L)dL | $L^3n(L)dL$ | $L^4n(L)dL$ | $L^2n(L)dL$ | $Ln(L)dL$ |
|-----|-------|----------|----------|-------------|-------------|-------------|-----------|
| 141 | 7 | 247.3684 | 141 | 48363 | 338541 | 6908.999 | 986.9999 |
| 271 | 8.01 | 268.3168 | 271 | 139273 | 1115576 | 17387.39 | 2170.71 |
| 214 | 9.01 | 214 | 214 | 156526.6 | 1410305 | 17372.54 | 1928.14 |
| 195 | 9.97 | 203.125 | 195 | 193250.3 | 1926705 | 19383.18 | 1944.15 |
| 176 | 11.03 | 166.0377 | 176 | 236177.8 | 2605041 | 21412.31 | 1941.28 |
| 160 | 12 | 164.9484 | 159.9999 | 276479.9 | 3317759 | 23039.99 | 1919.999 |
| 290 | 13.05 | 276.1904 | 289.9999 | 644509.6 | 8410851 | 49387.71 | 3784.499 |
| 164 | 14.2 | 142.6086 | 163.9999 | 469578.9 | 6668021 | 33068.94 | 2328.798 |
| 161 | 15.98 | 90.44943 | 161 | 656986.1 | 10498637 | 41113.02 | 2572.78 |
| 73 | 17.09 | 65.76576 | 72.99999 | 364375.4 | 6227175 | 21320.97 | 1247.57 |
| 89 | 18.91 | 48.90109 | 88.99998 | 601817.1 | 11380361 | 31825.34 | 1682.99 |
| 52 | 20.23 | 39.39393 | 51.99999 | 430517.6 | 8709371 | 21281.15 | 1051.96 |
| 36 | 22.01 | 20.22471 | 35.99998 | 383850.8 | 8448556 | 17439.84 | 792.3596 |
| 28 | 23.95 | 14.43298 | 27.99998 | 384657.6 | 9212549 | 16060.86 | 670.5995 |
| 18 | 26.05 | 8.571428 | 18 | 318196.7 | 8289024 | 12214.84 | 468.9 |
| 11 | 28.34 | 4.803493 | 11 | 250375.7 | 7095647 | 8834.711 | 311.74 |
| 3 | 30.32 | 1.515151 | 2.999999 | 83619.72 | 2535350 | 2757.906 | 90.95997 |
| 0 | 32.43 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 34.12 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 36.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 38.39 | 0.5291 | 0.999999 | 56578.82 | 2172061 | 1473.791 | 38.38996 |
| 0 | 40.38 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 42.47 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 44.68 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 46.21 | 0.653594 | 0.999999 | 98675.06 | 4559774 | 2135.362 | 46.20995 |
| | | Sum = | | 2084 | 5793810 | 1.05E+08 | 364418.8 |
| | | | m0 | | | m2 | m1 |
| | | C.V= | 0.353919 | | | | |

MS#29.dat

mass mean=16.33072 μ m

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $Ln(L)dL$ | $L^2n(L)dL$ |
|-------|-------|----------|-------------|-------------|-----------|-------------|
| 26614 | 8.12 | 15747.92 | 14248790 | 1.16E+08 | 216105.6 | 1754777 |
| 27753 | 10.08 | 14159.69 | 28424407 | 2.87E+08 | 279750.2 | 2819882 |
| 17898 | 12.11 | 8816.748 | 31786074 | 3.85E+08 | 216744.8 | 2624779 |
| 9706 | 14.07 | 4952.04 | 27034759 | 3.8E+08 | 136563.4 | 1921447 |
| 6760 | 16.07 | 3380 | 28053970 | 4.51E+08 | 108633.2 | 1745736 |
| 4320 | 18.06 | 2170.854 | 25447020 | 4.6E+08 | 78019.19 | 1409027 |
| 2932 | 20.29 | 1314.798 | 24491199 | 4.97E+08 | 59490.27 | 1207058 |
| 1561 | 22.42 | 732.8638 | 17591776 | 3.94E+08 | 34997.62 | 784646.6 |
| 675 | 24.37 | 346.1538 | 9769454 | 2.38E+08 | 16449.75 | 400880.4 |
| 365 | 26.49 | 172.1698 | 6784826 | 1.8E+08 | 9668.849 | 256127.8 |
| 161 | 28.31 | 88.46153 | 3652964 | 1.03E+08 | 4557.91 | 129034.4 |
| 80 | 30.26 | 41.02564 | 2216648 | 67075771 | 2420.8 | 73253.41 |
| 38 | 32.35 | 18.18181 | 1286490 | 41617936 | 1229.299 | 39767.84 |
| 6 | 34.58 | 2.690582 | 248099.6 | 8579284 | 207.4799 | 7174.656 |
| 2 | 36.35 | 1.129943 | 96060.1 | 3491785 | 72.69997 | 2642.644 |
| sum= | 98871 | | 2.21E+08 | 3.61E+09 | 1164911 | 15176232 |
| | m0 | | | | m1 | m2 |
| | C.V= | 0.325155 | | | | |

mass mean=25.44466 μ m MS#31.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $\ln(L)dL$ | $L^2n(L)dL$ |
|-------|-------|----------|-------------|-------------|------------|-------------|
| 274 | 8.01 | 173.4177 | 140814.7 | 1127926 | 2194.74 | 17579.87 |
| 253 | 10.14 | 118.7793 | 263775.5 | 2674683 | 2565.42 | 26013.36 |
| 131 | 12 | 70.43011 | 226368 | 2716416 | 1572 | 18864 |
| 166 | 14.2 | 75.45455 | 475305.8 | 6749342 | 2357.2 | 33472.24 |
| 117 | 16.25 | 57.07317 | 502048.8 | 8158293 | 1901.25 | 30895.31 |
| 93 | 18.28 | 45.81281 | 568082.6 | 10384551 | 1700.04 | 31076.73 |
| 57 | 20.23 | 29.23077 | 471913.6 | 9546812 | 1153.11 | 23327.42 |
| 60 | 22.01 | 33.70787 | 639751.6 | 14080933 | 1320.6 | 29066.41 |
| 70 | 24.35 | 29.91453 | 1010636 | 24608996 | 1704.5 | 41504.58 |
| 49 | 26.49 | 22.8972 | 910839.7 | 24128144 | 1298.01 | 34384.28 |
| 25 | 28.34 | 13.51351 | 569035.7 | 16126473 | 708.5 | 20078.89 |
| 22 | 30.32 | 11.11111 | 613211.5 | 18592572 | 667.04 | 20224.65 |
| 13 | 31.89 | 8.280255 | 421606.1 | 13445019 | 414.57 | 13220.64 |
| 8 | 34.12 | 3.587444 | 317773 | 10842416 | 272.96 | 9313.395 |
| 4 | 35.89 | 2.259887 | 184918.5 | 6636725 | 143.56 | 5152.368 |
| 7 | 37.75 | 3.763441 | 376572.8 | 14215622 | 264.25 | 9975.438 |
| 2 | 39.71 | 1.020408 | 125236.1 | 4973127 | 79.42 | 3153.768 |
| 3 | 41.76 | 1.463415 | 218475.5 | 9123537 | 125.28 | 5231.693 |
| 1 | 43.93 | 0.460829 | 84778.09 | 3724301 | 43.93 | 1929.845 |
| 0 | 46.21 | 0 | 0 | 0 | 0 | 0 |
| 0 | 48.61 | 0 | 0 | 0 | 0 | 0 |
| 0 | 50.27 | 0 | 0 | 0 | 0 | 0 |
| 0 | 52 | 0 | 0 | 0 | 0 | 0 |
| 1 | 54.69 | 0.371747 | 163577.6 | 8946058 | 54.69 | 2990.996 |
| sum = | 1356 | | 8284722 | 2.11E+08 | 20541.07 | 377455.9 |
| m0 | | | | m1 | m2 | |

C.V= 0.461577

MS#32.dat

mass mean=28.53776 μ m

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $\ln(L)dL$ | $L^2n(L)dL$ |
|------|-------|----------|-------------|-------------|------------|-------------|
| 3393 | 8.01 | 2147.468 | 1743738 | 13967347 | 27177.92 | 217695.1 |
| 3711 | 10.14 | 1742.253 | 3869054 | 39232210 | 37629.54 | 381563.5 |
| 2320 | 12 | 1247.311 | 4008960 | 48107520 | 27840 | 334080 |
| 2589 | 14.2 | 1176.818 | 7413052 | 1.1E+08 | 36763.8 | 522045.9 |
| 1694 | 15.98 | 951.6853 | 6912636 | 1.1E+08 | 27070.12 | 432580.5 |
| 1589 | 17.98 | 794.5 | 9236192 | 1.7E+08 | 28570.22 | 513692.5 |
| 1109 | 19.89 | 580.6282 | 8726415 | 1.7E+08 | 22058.01 | 438733.8 |
| 1221 | 22.01 | 575.9433 | 13018944 | 2.9E+08 | 26874.21 | 591501.3 |
| 1028 | 23.95 | 529.8969 | 14122437 | 3.4E+08 | 24620.6 | 589663.3 |
| 881 | 26.05 | 419.5238 | 15573961 | 4.1E+08 | 22950.05 | 597848.8 |
| 834 | 28.34 | 364.1921 | 18983032 | 5.4E+08 | 23635.56 | 669831.8 |
| 547 | 30.32 | 276.2626 | 15246667 | 4.6E+08 | 16585.04 | 502858.4 |
| 469 | 32.98 | 176.3157 | 16823827 | 5.5E+08 | 15467.62 | 510122.1 |
| 344 | 35.29 | 148.9177 | 15118664 | 5.3E+08 | 12139.76 | 428412.1 |
| 195 | 37.12 | 106.5573 | 9973750 | 3.7E+08 | 7238.399 | 268689.4 |
| 154 | 39.04 | 80.20833 | 9163262 | 3.6E+08 | 6012.159 | 234714.7 |
| 83 | 41.07 | 40.88669 | 5749792 | 2.4E+08 | 3408.809 | 139999.8 |
| 67 | 43.2 | 31.45539 | 5401645 | 2.3E+08 | 2894.4 | 125038.1 |
| 42 | 45.44 | 18.75 | 3940617 | 1.8E+08 | 1908.48 | 86721.32 |
| 24 | 47.79 | 10.21276 | 2619523 | 1.3E+08 | 1146.96 | 54813.2 |
| 11 | 49.43 | 6.707317 | 1328509 | 65668202 | 543.73 | 26876.57 |
| 8 | 51.13 | 4.705882 | 1069343 | 54675549 | 409.0397 | 20914.2 |
| 3 | 53.78 | 1.132075 | 466641.8 | 25095996 | 161.34 | 8676.865 |
| sum= | 22316 | | 1.91E+08 | 5.44E+09 | 373105.8 | 7697073 |
| m0 | | | | m1 | m2 | |

C.V= 0.483627

ms#36.dat
mass mean = 28.06003 μ m

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $\ln(L)dL$ | $L^2n(L)dL$ |
|------|-------|----------|-------------|-------------|------------|-------------|
| 1862 | 8.01 | 1178.481 | 956923.3 | 7664956 | 14914.62 | 119466.1 |
| 2904 | 9.97 | 1481.632 | 2877940 | 28693066 | 28952.86 | 288660 |
| 2782 | 12 | 1370.443 | 4807295 | 57687549 | 33383.99 | 400607.9 |
| 2558 | 13.96 | 1305.102 | 6959158 | 97149850 | 35709.67 | 498507 |
| 2074 | 15.98 | 1026.732 | 8463286 | 1.4E+08 | 33142.52 | 529617.4 |
| 1714 | 17.98 | 857 | 9962764 | 1.8E+08 | 30817.72 | 554102.6 |
| 1548 | 20.23 | 688 | 12816180 | 2.6E+08 | 31316.04 | 633523.5 |
| 829 | 22.01 | 465.7303 | 8839234 | 1.9E+08 | 18246.29 | 401600.8 |
| 727 | 23.95 | 374.7422 | 9987364 | 2.4E+08 | 17411.65 | 417008.9 |
| 613 | 26.05 | 291.9047 | 10836365 | 2.8E+08 | 15968.65 | 415983.3 |
| 570 | 28.34 | 248.9082 | 12974013 | 3.7E+08 | 16153.8 | 457798.6 |
| 349 | 30.32 | 176.2626 | 9727763 | 2.9E+08 | 10581.68 | 320836.5 |
| 350 | 32.43 | 165.8767 | 11937375 | 3.9E+08 | 11350.5 | 368096.7 |
| 217 | 34.12 | 128.4023 | 8619593 | 2.9E+08 | 7404.03 | 252625.8 |
| 196 | 35.89 | 110.7344 | 9061005 | 3.3E+08 | 7034.439 | 252466 |
| 225 | 38.39 | 90 | 12730247 | 4.9E+08 | 8637.75 | 331603.2 |
| 146 | 40.38 | 73.36683 | 9612840 | 3.9E+08 | 5895.479 | 238059.4 |
| 74 | 42.47 | 35.40669 | 5668633 | 2.4E+08 | 3142.779 | 133473.8 |
| 44 | 44.68 | 19.9095 | 3924568 | 1.8E+08 | 1965.919 | 87837.24 |
| 13 | 46.21 | 8.496732 | 1282777 | 59277136 | 600.7299 | 27759.73 |
| 10 | 48.61 | 4.166666 | 1148621 | 55834480 | 486.0999 | 23629.31 |
| 1 | 50.27 | 0.602409 | 127035.9 | 6386097 | 50.26998 | 2527.072 |
| 3 | 52 | 1.734104 | 421823.9 | 21934847 | 156 | 8111.998 |
| sum= | 19809 | | 1.64E+08 | 4.59E+09 | 333323.5 | 6763903 |
| m0 | | | | m1 | | m2 |

C.V= 0.453814

mass mean = 27.80371 μ m

ms#37.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $\ln(L)dL$ | $L^2n(L)dL$ |
|-------|-------|----------|-------------|-------------|------------|-------------|
| 9382 | 8.01 | 5937.974 | 4821619 | 38621173 | 75149.8 | 601949.9 |
| 10375 | 9.97 | 5293.367 | 10281903 | 1E+08 | 103438.7 | 1031284 |
| 4554 | 11.21 | 3672.58 | 6415194 | 71914331 | 51050.33 | 572274.2 |
| 6015 | 13.05 | 3269.021 | 13368021 | 1.7E+08 | 78495.74 | 1024369 |
| 4686 | 14.93 | 2492.553 | 15594866 | 2.3E+08 | 69961.97 | 1044532 |
| 4322 | 17.09 | 2000.925 | 21573019 | 3.7E+08 | 73862.98 | 1262318 |
| 2774 | 19.23 | 1296.261 | 19726239 | 3.8E+08 | 53344.02 | 1025805 |
| 2004 | 20.92 | 1185.798 | 18347746 | 3.8E+08 | 41923.68 | 877043.3 |
| 2193 | 23.15 | 983.408 | 27207685 | 6.3E+08 | 50767.95 | 1175278 |
| 1555 | 25.19 | 762.2549 | 24855064 | 6.3E+08 | 39170.45 | 986703.6 |
| 1121 | 26.94 | 640.5714 | 21917871 | 5.9E+08 | 30199.74 | 813581 |
| 947 | 28.82 | 503.7234 | 22668976 | 6.5E+08 | 27292.54 | 786571 |
| 679 | 30.32 | 452.6666 | 18925935 | 5.7E+08 | 20587.28 | 624206.3 |
| 559 | 31.89 | 356.0509 | 18129063 | 5.8E+08 | 17826.51 | 568487.4 |
| 472 | 34.12 | 211.6591 | 18748609 | 6.4E+08 | 16104.64 | 549490.3 |
| 373 | 35.89 | 210.7344 | 17243649 | 6.2E+08 | 13386.97 | 480458.3 |
| 296 | 37.75 | 159.1397 | 15923647 | 6E+08 | 11174 | 421818.5 |
| 187 | 39.71 | 95.40816 | 11709577 | 4.6E+08 | 7425.769 | 294877.3 |
| 155 | 41.76 | 75.60975 | 11287898 | 4.7E+08 | 6472.799 | 270304.1 |
| 126 | 43.93 | 58.06451 | 10682037 | 4.7E+08 | 5535.179 | 243160.4 |
| 84 | 46.21 | 36.8421 | 8288714 | 3.8E+08 | 3881.64 | 179370.6 |
| 37 | 47.79 | 23.41772 | 4038431 | 1.9E+08 | 1768.229 | 84503.68 |
| 41 | 50.27 | 16.53225 | 5208473 | 2.6E+08 | 2061.07 | 103610 |
| 23 | 52 | 13.29479 | 3233982 | 1.7E+08 | 1195.999 | 62191.96 |
| 14 | 54.69 | 5.20446 | 2290086 | 1.3E+08 | 765.66 | 41873.94 |
| sum= | 52974 | | 3.5E+08 | 9.8E+09 | 802843.7 | 15126063 |
| m0 | | | | m1 | | m2 |

C.V= 0.493112

| mass mean=26.70833 μm | | | | | | | MSF38.dat | | | | | | | | | | | | | | | |
|-----------------------|-------|--------------|-----------------|-----------------|-----------------|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----------|---------|----------|----------|----------|---------|----------|
| L | N | n(L) | L'γn(l)μL | L'4n(l)μL | Lαn(l)μL | L'2n(l)μL | L | N | n(L) | L'γn(l)μL | L'4n(l)μL | Lαn(l)μL | L'2n(l)μL | | | | | | | | | |
| 8.01 | 5924 | 3749.367 | 3044476 | 24386255 | 47451.24 | 380084.4 | 10.14 | 5967 | 2801.408 | 6221138 | 63082339 | 60505.37 | 613524.5 | | | | | | | | | |
| 12 | 2931 | 1575.806 | 5064767 | 60777199 | 35171.99 | 422063.9 | 13.96 | 2332 | 1189.795 | 6344311 | 88566582 | 32554.69 | 454463.5 | | | | | | | | | |
| 15.19 | 1040 | 845.5784 | 3645076 | 55368710 | 15797.6 | 239965.5 | 16.81 | 1149 | 709.2592 | 5457869 | 91746783 | 19314.69 | 324679.9 | | | | | | | | | |
| 17.98 | 678 | 579.4871 | 3940930 | 70857917 | 12190.44 | 219184.1 | 19.89 | 766 | 401.0471 | 60277443 | 1.2E+08 | 15235.74 | 303038.9 | | | | | | | | | |
| 20.92 | 405 | 393.2038 | 37088002 | 77571404 | 8472.598 | 177246.8 | 22.01 | 404 | 370.6422 | 4307661 | 9481613 | 8892.04 | 195713.8 | | | | | | | | | |
| 23.95 | 598 | 308.2474 | 8215192 | 1.97E+08 | 14322.1 | 343014.3 | 25.19 | 308 | 4923059 | 1.24E+08 | 7758.517 | 19537 | 185795.5 | | | | | | | | | |
| 26.94 | 256 | 146.2857 | 5005330 | 1.35E+08 | 6896.639 | 85429.45 | 28.34 | 265 | 189.2857 | 6031778 | 1.71E+08 | 7510.059 | 212836.2 | | | | | | | | | |
| 29.81 | 219 | 148.9795 | 5801359 | 1.73E+08 | 6528.386 | 194611.2 | 31.89 | 252 | 121.538 | 8172669 | 2.61E+08 | 8036.277 | 256276.9 | | | | | | | | | |
| 34.12 | 126 | 56.50224 | 5004925 | 1.71E+08 | 4299.12 | 146686 | 35.89 | 131 | 74.01129 | 6055680 | 2.17E+08 | 4701.589 | 168740 | | | | | | | | | |
| 37.12 | 62 | 50.4065 | 3171141 | 1.18E+08 | 2301.44 | 85429.45 | 39.04 | 69 | 35.9375 | 4105618 | 1.6E+08 | 2693.76 | 105164.4 | | | | | | | | | |
| 41.07 | 74 | 36.4532 | 5126321 | 2.11E+08 | 3039.18 | 124819.1 | 43.2 | 52 | 24.41314 | 4192321 | 1.81E+08 | 2246.399 | 97044.46 | | | | | | | | | |
| 45.44 | 39 | 17.41071 | 3659144 | 1.66E+08 | 1772.16 | 80526.93 | 47.79 | 17 | 7.234042 | 1855496 | 88674145 | 812.4299 | 38826.03 | | | | | | | | | |
| 49.43 | 9 | 5.487804 | 1086962 | 53728521 | 444.8699 | 21989.92 | 51.13 | 11 | 6.470588 | 1470348 | 75178873 | 562.43 | 28757.04 | | | | | | | | | |
| sum = | | 24084 | 1.22E+08 | 3.25E+09 | 319511.8 | 5615920 | ml | | ml | ml | ml | ml | ml | | | | | | | | | |
| mass mean=23.15767 μm | | | | | | | MSF38.dat | | | | | | | | | | | | | | | |
| N | L | n(L) | L'3n(l)μL | L'γn(l)μL | L'4n(l)μL | Lαn(l)μL | L'2n(l)μL | N | L | n(L) | L'3n(l)μL | L'γn(l)μL | L'4n(l)μL | Lαn(l)μL | L'2n(l)μL | | | | | | | |
| 4115 | 8.01 | 2604.43 | 2114790 | 16939471 | 37961.15 | 264018.8 | 3872 | 9.97 | 1975.51 | 3832756 | 38257443 | 38603.84 | 384880.2 | 1532 | 11.21 | 1235.483 | 2158119 | 24192509 | 17173.71 | 192517.3 | | |
| 1718 | 12.83 | 1060.49 | 3628286 | 46530915 | 22041.86 | 282797.1 | 949 | 13.96 | 839.823 | 2581799 | 36041917 | 13248.04 | 184942.6 | 663 | 14.93 | 683.5051 | 2206444 | 32942209 | 9898.589 | 147785.9 | | |
| 605 | 15.98 | 577.1428 | 2472879 | 39516610 | 9683.879 | 154748.4 | 591 | 17.09 | 532.4324 | 2049843 | 50414528 | 10100.19 | 172612.2 | 659 | 18.16 | 436.4238 | 4240570 | 78874597 | 12257.4 | 222777.7 | | |
| 592 | 20.23 | 363.1901 | 4901277 | 99152835 | 11976.16 | 242777.7 | 533 | 22.01 | 299.4382 | 5683127 | 1.25E+08 | 11731.33 | 258206.6 | 491 | 23.95 | 253.0827 | 6745248 | 1.62E+08 | 11759.45 | 281638.7 | | |
| 158 | 25.19 | 127.4193 | 2525465 | 63616470 | 3980.018 | 100256.7 | 168 | 26.05 | 195.3488 | 29659835 | 77364213 | 4376.399 | 114005.2 | 141 | 26.94 | 158.4269 | 2755841 | 74269294 | 3798.538 | 102332.6 | | |
| 141 | 28.34 | 100.7142 | 3209359 | 90953230 | 3995.937 | 113244.8 | 103 | 29.31 | 106.1835 | 2593489 | 76015162 | 3018.938 | 88434.78 | 95 | 31.36 | 101.9801 | 2870942 | 87046957 | 3122.957 | 94688.06 | | |
| 81 | 32.98 | 50 | 2905608 | 95826941 | 91881442 | 2979.2 | 12671.38 | 88102.11 | 13 | 39.04 | 10.07751 | 773521.5 | 30198278 | 507.5195 | 19813.56 | 43 | 35.29 | 36.75213 | 1889833 | 66692195 | 1517.47 | 53551.51 |
| 70 | 34.12 | 61.0435 | 2780514 | 94871129 | 2388.4 | 81492.2 | 34 | 36.5 | 28.08917 | 1653322 | 60346234 | 1241 | 45296.49 | 18 | 37.75 | 14.4 | 966330 | 36554456 | 679.5 | 25651.13 | | |
| 11 | 40.38 | 8.208935 | 724255.2 | 29245425 | 444.18 | 17935.99 | 8 | 41.76 | 5.797101 | 5826013 | 24379479 | 334.08 | 13951.18 | 2 | 43.2 | 1.388888 | 161243 | 6956699 | 86.38994 | 3732.478 | | |
| sum = | | 17510 | ml0 | C.V = | 0.452327 | ml1 | ml0 | ml1 | ml2 | ml0 | ml1 | ml2 | ml0 | ml1 | ml2 | | | | | | | |

| mass mean=53.23344 μ m | | | | MS#40.dat | | | |
|----------------------------|----------|----------|-----------|-----------|----------|-----------|--|
| N | L | n(L) | L^3n(L)dL | L^4n(L)dL | Ln(L)dL | L^2n(L)dL | |
| 443 | 10.03 | 219.3069 | 427083.2 | 4283644 | 4245.322 | 42580.58 | |
| 583 | 12.18 | 271.1627 | 1053441 | 12830913 | 7100.938 | 86489.42 | |
| 464 | 14.22 | 227.4509 | 1334187 | 18972135 | 6598.078 | 93824.66 | |
| 451 | 15.98 | 256.25 | 1840377 | 29409229 | 7206.98 | 115167.5 | |
| 399 | 17.95 | 202.538 | 2307630 | 41421951 | 7162.047 | 128558.8 | |
| 342 | 20.17 | 154.054 | 2806362 | 56604316 | 6898.138 | 139135.4 | |
| 257 | 22.22 | 125.3658 | 2819455 | 62648281 | 5710.538 | 126888.1 | |
| 205 | 24.02 | 113.8888 | 2841008 | 68241024 | 4924.096 | 118276.8 | |
| 149 | 25.96 | 76.80412 | 2606756 | 67671375 | 3868.04 | 100414.3 | |
| 159 | 28.6 | 60.22727 | 3719591 | 1.06E+08 | 4547.4 | 130055.6 | |
| 110 | 30.32 | 63.95348 | 3066057 | 92962847 | 3335.2 | 101123.3 | |
| 101 | 32.14 | 55.4945 | 3353196 | 1.08E+08 | 3246.14 | 104330.9 | |
| 104 | 34.06 | 54.16666 | 4109294 | 1.4E+08 | 3542.24 | 120648.7 | |
| 109 | 36.11 | 53.17073 | 5132264 | 1.85E+08 | 3935.99 | 142128.6 | |
| 87 | 38.27 | 40.27777 | 4876346 | 1.87E+08 | 3329.489 | 127419.6 | |
| 75 | 40.57 | 32.60869 | 5008137 | 2.03E+08 | 3042.749 | 123444.3 | |
| 36 | 42.17 | 22.5 | 2699686 | 1.14E+08 | 1518.12 | 64019.12 | |
| 52 | 43.84 | 31.13772 | 4381420 | 1.92E+08 | 2279.68 | 99941.16 | |
| 75 | 46.47 | 28.51711 | 7526261 | 3.5E+08 | 3485.25 | 161959.6 | |
| 33 | 48.31 | 17.93478 | 3720703 | 1.8E+08 | 1594.23 | 77017.24 | |
| 40 | 50.22 | 20.9424 | 5066289 | 2.54E+08 | 2008.799 | 100881.9 | |
| 31 | 53.24 | 10.2649 | 4678168 | 2.49E+08 | 1650.44 | 87869.42 | |
| 21 | 55.34 | 10 | 3559072 | 1.97E+08 | 1162.14 | 64312.83 | |
| 27 | 57.53 | 12.32876 | 5140989 | 2.96E+08 | 1553.309 | 89361.87 | |
| 29 | 59.81 | 12.71929 | 6204676 | 3.71E+08 | 1734.489 | 103739.8 | |
| 20 | 62.18 | 8.438818 | 4808196 | 2.99E+08 | 1243.6 | 77327.04 | |
| 27 | 64.64 | 10.9756 | 7292349 | 4.71E+08 | 1745.278 | 112814.8 | |
| 15 | 67.2 | 5.859375 | 4551967 | 3.06E+08 | 1008 | 67737.6 | |
| 6 | 69.86 | 2.255639 | 2045677 | 1.43E+08 | 419.16 | 29282.52 | |
| 7 | 72.62 | 2.536231 | 2680814 | 1.95E+08 | 508.3398 | 36915.64 | |
| 6 | 75.5 | 2.083333 | 2582213 | 1.95E+08 | 452.9999 | 34201.49 | |
| 15 | 78.49 | 5.016722 | 7253276 | 5.69E+08 | 1177.35 | 92410.19 | |
| 8 | 81.59 | 2.580645 | 4345110 | 3.55E+08 | 652.72 | 53255.42 | |
| 6 | 84.82 | 1.857585 | 3661390 | 3.11E+08 | 508.92 | 43166.59 | |
| 5 | 88.18 | 1.488095 | 3428311 | 3.02E+08 | 440.8999 | 38878.56 | |
| 3 | 91.67 | 0.859598 | 2311014 | 2.12E+08 | 275.0097 | 25210.14 | |
| 7 | 95.3 | 1.928374 | 6058660 | 5.77E+08 | 667.0998 | 63574.61 | |
| sum = | 4507 | | 1.41E+08 | 7.52E+09 | 104779.2 | 3324364 | |
| | m0 | | | | m1 | m2 | |
| C.V = | 0.603926 | | | | | | |

| mass mean = 58.18996 μm MS#40a.dat | | | | | | |
|------------------------------------|----------|----------|-----------|-----------|----------|-----------|
| N | L | n(L) | L^3n(L)dL | L^4n(L)dL | Ln(L)dL | L^2n(L)dL |
| 898 | 10.03 | 465.285 | 906106.3 | 9088246 | 9006.94 | 90339.61 |
| 861 | 11.94 | 450.7853 | 1465602 | 17499291 | 10280.34 | 122747.3 |
| 674 | 14.22 | 295.614 | 1938022 | 27558672 | 9584.28 | 136288.5 |
| 684 | 16.29 | 330.4348 | 2956782 | 48165984 | 11142.36 | 181509 |
| 299 | 18.3 | 148.7562 | 1632418 | 33533242 | 5471.7 | 100132.1 |
| 282 | 20.17 | 150.8021 | 2314018 | 46673751 | 5687.94 | 114725.7 |
| 200 | 22.22 | 57.56098 | 2194129 | 48753547 | 4444 | 98745.68 |
| 221 | 24.49 | 97.35683 | 3246076 | 79496391 | 5412.29 | 132547 |
| 107 | 26.47 | 54.0404 | 1984475 | 52529050 | 2832.29 | 74970.72 |
| 109 | 28.6 | 51.17371 | 2549909 | 72927383 | 3117.4 | 89157.64 |
| 69 | 30.32 | 40.11628 | 1923254 | 58313066 | 2092.08 | 63431.87 |
| 74 | 32.14 | 40.65934 | 2456797 | 78961467 | 2378.36 | 76440.49 |
| 91 | 34.06 | 47.39583 | 3595633 | 1.22E+08 | 3099.46 | 105567.6 |
| 80 | 36.11 | 39.02439 | 3766799 | 1.36E+08 | 2888.8 | 104314.6 |
| 92 | 38.27 | 42.59259 | 5156597 | 1.97E+08 | 3520.84 | 134742.5 |
| 76 | 40.57 | 33.04348 | 5074913 | 2.06E+08 | 3083.32 | 125090.3 |
| 35 | 42.17 | 21.875 | 2624695 | 1.11E+08 | 1475.95 | 62240.81 |
| 65 | 44.7 | 25.6917 | 5805450 | 2.6E+08 | 2905.5 | 129875.9 |
| 46 | 46.47 | 25.9887 | 4616107 | 2.15E+08 | 2137.62 | 99335.2 |
| 40 | 48.31 | 21.73913 | 4509944 | 2.18E+08 | 1932.4 | 93354.24 |
| 47 | 50.22 | 24.60733 | 5952892 | 2.99E+08 | 2360.34 | 118536.3 |
| 41 | 53.24 | 13.57616 | 6187255 | 3.29E+08 | 2182.84 | 116214.4 |
| 26 | 55.34 | 12.38095 | 4406470 | 2.44E+08 | 1438.84 | 79625.41 |
| 38 | 57.53 | 17.3516 | 7235470 | 4.16E+08 | 2186.14 | 125768.6 |
| 31 | 59.81 | 13.59649 | 6632589 | 3.97E+08 | 1854.11 | 110894.3 |
| 31 | 62.18 | 13.08017 | 7452704 | 4.63E+08 | 1927.58 | 119856.9 |
| 26 | 64.64 | 10.56911 | 7022268 | 4.54E+08 | 1680.64 | 108636.6 |
| 26 | 67.2 | 10.15625 | 7890076 | 5.3E+08 | 1747.2 | 117411.8 |
| 26 | 69.86 | 9.774436 | 8864599 | 6.19E+08 | 1816.36 | 126890.9 |
| 20 | 72.62 | 7.246377 | 7659470 | 5.56E+08 | 1452.4 | 105473.3 |
| 11 | 74.05 | 7.692308 | 4466506 | 3.31E+08 | 814.55 | 60317.43 |
| 5 | 75.5 | 3.448276 | 2151844 | 1.62E+08 | 377.5 | 28501.25 |
| 6 | 76.98 | 4.054054 | 2737064 | 2.11E+08 | 461.88 | 35555.52 |
| 6 | 78.49 | 3.97351 | 2901311 | 2.28E+08 | 470.94 | 36964.08 |
| 6 | 80.03 | 3.896104 | 3075457 | 2.46E+08 | 480.18 | 38428.81 |
| 7 | 81.59 | 4.487179 | 3801971 | 3.1E+08 | 571.13 | 46598.5 |
| 5 | 83.19 | 3.125 | 2878614 | 2.39E+08 | 415.95 | 34602.88 |
| 8 | 84.82 | 4.907975 | 4881854 | 4.14E+08 | 678.56 | 57555.46 |
| 4 | 86.49 | 2.39521 | 2587961 | 2.24E+08 | 345.96 | 29922.08 |
| 4 | 88.18 | 2.366864 | 2742649 | 2.42E+08 | 352.72 | 31102.85 |
| 3 | 89.91 | 1.734104 | 2180446 | 1.96E+08 | 269.73 | 24251.42 |
| 2 | 91.67 | 1.136364 | 1540677 | 1.41E+08 | 183.34 | 16806.78 |
| 2 | 93.47 | 1.111111 | 1633228 | 1.53E+08 | 186.94 | 17473.28 |
| 10 | 95.3 | 5.464481 | 8655232 | 8.25E+08 | 953 | 90820.9 |
| sum = | 5394 | | 1.76E+08 | 1.03E+10 | 117702.7 | 3813767 |
| m0 | | | | | m1 | m2 |
| C.V. = | 0.696335 | | | | | |

mass mean=37.74886 μ m MS#41.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $Ln(L)dL$ | $L^2n(L)dL$ |
|------|-------|----------|-------------|-------------|-----------|-------------|
| 329 | 10.03 | 162.8712 | 331969.8 | 54068363 | 3299.869 | 33097.69 |
| 309 | 11.94 | 161.7801 | 525982.6 | 85093536 | 3689.459 | 44052.14 |
| 269 | 13.95 | 133.8308 | 730255.6 | 97730726 | 3752.55 | 52348.07 |
| 354 | 15.98 | 174.3842 | 1444553 | 2.5E+08 | 5656.919 | 90397.56 |
| 301 | 17.95 | 152.7918 | 1740843 | 2.7E+08 | 5402.947 | 96982.9 |
| 215 | 20.17 | 96.84684 | 1764233 | 1.7E+08 | 4336.548 | 87468.17 |
| 135 | 22.22 | 65.85365 | 1481037 | 97531710 | 2999.7 | 66653.33 |
| 107 | 24.02 | 59.44444 | 1482869 | 88148324 | 2570.14 | 61734.76 |
| 80 | 25.96 | 41.23711 | 1399600 | 57715479 | 2076.799 | 53913.71 |
| 90 | 28.05 | 43.0622 | 1986282 | 85533713 | 2524.499 | 70812.19 |
| 42 | 30.32 | 18.5022 | 1170676 | 21660092 | 1273.44 | 38610.69 |
| 37 | 32.14 | 20.32967 | 1228398 | 24972940 | 1189.179 | 38220.22 |
| 48 | 34.06 | 25 | 1896597 | 47414936 | 1634.88 | 55684 |
| 44 | 36.11 | 21.46341 | 2071739 | 44466603 | 1588.84 | 57373 |
| 46 | 38.27 | 21.29629 | 2578298 | 54908211 | 1760.42 | 67371.26 |
| 42 | 40.57 | 18.26086 | 2804557 | 51213654 | 1703.94 | 69128.84 |
| 19 | 42.17 | 11.875 | 1424834 | 16919908 | 801.2298 | 33787.86 |
| 19 | 43.84 | 11.37724 | 1600903 | 18213875 | 832.9596 | 36516.95 |
| 18 | 45.58 | 10.34482 | 1704493 | 17632696 | 820.4395 | 37395.63 |
| 8 | 47.38 | 4.444444 | 850893.4 | 3781748 | 379.04 | 17958.92 |
| 10 | 49.26 | 5.319148 | 1195317 | 6358070 | 492.5999 | 24265.47 |
| 7 | 51.21 | 3.589743 | 940074.7 | 3374627 | 358.47 | 18357.25 |
| 14 | 53.24 | 6.896551 | 2112721 | 14570490 | 745.36 | 39682.96 |
| 8 | 55.34 | 3.809523 | 1355836 | 5165092 | 442.7197 | 24500.11 |
| 7 | 57.53 | 3.196347 | 1332849 | 4260250 | 402.7098 | 23167.9 |
| 3 | 59.81 | 1.315789 | 641863.4 | 844557.2 | 179.43 | 10731.71 |
| 3 | 62.18 | 1.265822 | 721229.3 | 912948.5 | 186.54 | 11599.06 |
| 2 | 64.64 | 0.813008 | 540174.4 | 439166.2 | 129.28 | 8356.658 |
| 1 | 67.2 | 0.390625 | 303464.4 | 118540.8 | 67.19999 | 4515.839 |
| 4 | 69.86 | 1.503759 | 1363784 | 2050803 | 279.4399 | 19521.67 |
| 1 | 72.62 | 0.362318 | 382973.5 | 138758.5 | 72.62 | 5273.664 |
| 0 | 75.5 | 0 | 0 | 0 | 0 | 0 |
| 0 | 76.98 | 0 | 0 | 0 | 0 | 0 |
| 1 | 78.49 | 0.662251 | 483551.7 | 320232.9 | 78.48999 | 6160.679 |
| 0 | 80.03 | 0 | 0 | 0 | 0 | 0 |
| 0 | 81.59 | 0 | 0 | 0 | 0 | 0 |
| 0 | 83.19 | 0 | 0 | 0 | 0 | 0 |
| 0 | 84.82 | 0 | 0 | 0 | 0 | 0 |
| 0 | 86.49 | 0 | 0 | 0 | 0 | 0 |
| 1 | 88.18 | 0.591715 | 685662.3 | 405717.3 | 88.18 | 7775.712 |
| sum= | 2574 | | 42278514 | 1.6E+09 | 51816.84 | 1313417 |
| m0 | | | | m1 | | m2 |

C.V = 0.509044

mass mean=38.62223 μ m ms#41a.dat

| N | L | n(L) | $L^3 n(L) dL$ | $L^4 n(L) dL$ | $Ln(L) dL$ | $L^2 n(L) dL$ |
|------|-------|----------|---------------|---------------|------------|---------------|
| 3550 | 10.03 | 1839.378 | 3582046 | 35927921 | 35606.5 | 357133.2 |
| 5505 | 11.94 | 2882.199 | 9370663 | 1.12E+08 | 65729.7 | 784812.6 |
| 3262 | 13.16 | 2673.77 | 7434498 | 97837988 | 42927.92 | 564931.4 |
| 5857 | 15.37 | 2650.226 | 21266539 | 3.27E+08 | 90022.09 | 1383640 |
| 5324 | 17.27 | 2802.105 | 27423006 | 4.74E+08 | 91945.48 | 1587898 |
| 4560 | 19.4 | 2140.845 | 33294311 | 6.46E+08 | 88464 | 1716202 |
| 3310 | 21.38 | 1671.717 | 32348273 | 6.92E+08 | 70767.8 | 1513016 |
| 3511 | 23.56 | 1610.55 | 45915222 | 1.08E+09 | 82719.16 | 1948863 |
| 1798 | 25.46 | 946.3158 | 29673234 | 7.55E+08 | 45777.08 | 1165484 |
| 1954 | 27.51 | 953.1707 | 40681441 | 1.12E+09 | 53754.54 | 1478787 |
| 908 | 29.74 | 407.1749 | 23884092 | 7.1E+08 | 27003.92 | 803096.6 |
| 1116 | 31.52 | 626.9663 | 34948040 | 1.1E+09 | 35176.32 | 1108758 |
| 1079 | 33.41 | 570.8995 | 40239342 | 1.34E+09 | 36049.39 | 1204410 |
| 1011 | 35.41 | 505.5 | 44887864 | 1.59E+09 | 35799.51 | 1267661 |
| 854 | 37.54 | 400.939 | 45179423 | 1.7E+09 | 32059.16 | 1203501 |
| 659 | 39.79 | 292.8889 | 41515209 | 1.65E+09 | 26221.61 | 1043358 |
| 378 | 41.36 | 240.7643 | 26744433 | 1.11E+09 | 15634.08 | 646625.5 |
| 362 | 43 | 220.7317 | 28781534 | 1.24E+09 | 15566 | 669338 |
| 379 | 45.58 | 146.8992 | 35889067 | 1.64E+09 | 17274.82 | 787386.3 |
| 230 | 47.38 | 127.7778 | 24463185 | 1.16E+09 | 10897.4 | 516318.8 |
| 189 | 49.26 | 100.5319 | 22591498 | 1.11E+09 | 9310.14 | 458617.5 |
| 172 | 51.21 | 88.20513 | 23098978 | 1.18E+09 | 8808.12 | 451063.8 |
| 66 | 53.24 | 32.51232 | 9959971 | 5.3E+08 | 3513.84 | 187076.8 |
| 123 | 55.34 | 58.57143 | 20845992 | 1.15E+09 | 6806.82 | 376689.4 |
| 90 | 57.53 | 41.09589 | 17136638 | 9.86E+08 | 5177.7 | 297873.1 |
| 73 | 59.81 | 32.01754 | 15618678 | 9.34E+08 | 4366.13 | 261138.2 |
| 51 | 62.18 | 21.51899 | 12260899 | 7.62E+08 | 3171.18 | 197184 |
| 45 | 64.64 | 18.29268 | 12153925 | 7.86E+08 | 2908.8 | 188024.8 |
| 37 | 67.2 | 14.45312 | 11228185 | 7.55E+08 | 2486.4 | 167086.1 |
| 30 | 69.86 | 11.2782 | 10228383 | 7.15E+08 | 2095.8 | 146412.6 |
| 12 | 71.23 | 8.759124 | 4336807 | 3.09E+08 | 854.76 | 60884.55 |
| 7 | 72.62 | 5.035971 | 2680815 | 1.95E+08 | 508.34 | 36915.65 |
| 12 | 74.05 | 8.391608 | 4872551 | 3.61E+08 | 888.6 | 65800.83 |
| 6 | 75.5 | 4.137931 | 2582213 | 1.95E+08 | 453 | 34201.5 |
| 6 | 76.98 | 4.054054 | 2737064 | 2.11E+08 | 461.88 | 35555.52 |
| 5 | 78.49 | 3.311258 | 2417739 | 1.9E+08 | 392.45 | 30803.4 |
| 8 | 80.03 | 5.194805 | 4100610 | 3.28E+08 | 640.24 | 51238.41 |
| 5 | 81.59 | 3.205128 | 2715694 | 2.22E+08 | 407.95 | 33284.64 |
| 1 | 83.19 | 0.625 | 575722.7 | 47894374 | 83.19 | 6920.576 |
| 2 | 84.82 | 1.226994 | 1220464 | 1.04E+08 | 169.64 | 14388.86 |
| 3 | 86.49 | 1.796407 | 1940971 | 1.68E+08 | 259.47 | 22441.56 |
| 3 | 88.18 | 1.775148 | 2056987 | 1.81E+08 | 264.54 | 23327.14 |
| 1 | 89.91 | 0.578035 | 726815.2 | 65347953 | 89.91 | 8083.808 |
| 0 | 91.67 | 0 | 0 | 0 | 0 | 0 |
| 4 | 93.47 | 2.222222 | 3266455 | 3.05E+08 | 373.88 | 34946.56 |
| 2 | 95.3 | 1.092896 | 1731046 | 1.65E+08 | 190.6 | 18164.18 |
| sum= | 46560 | | 7.91E+08 | 3.05E+10 | 974079.9 | 24959344 |
| m0 | | | | | m1 | m2 |

C.V = 0.474106

mass mean=9.723192 μ m MS#50.dat

| N | L | dN/dL | $L^3n(L)dL$ | $L^4n(L)dL$ | $\ln(L)dL$ | $L^2n(L)dL$ | n(L)dL |
|-----|-------|----------|-------------|-------------|------------|-------------|--------|
| 72 | 4.02 | 205.7143 | 4677.466 | 18803.41 | 289.44 | 1163.549 | 72 |
| 449 | 5 | 458.1633 | 56125 | 280625 | 2245 | 11225 | 449 |
| 307 | 6.1 | 279.0909 | 69683.17 | 425067.3 | 1872.7 | 11423.47 | 307 |
| 82 | 7.05 | 86.31579 | 28733.02 | 202567.8 | 578.1 | 4075.605 | 82 |
| 26 | 8.01 | 27.08333 | 13361.98 | 107029.5 | 208.26 | 1668.163 | 26 |
| 21 | 9.09 | 19.44444 | 15772.88 | 143375.5 | 190.89 | 1735.19 | 21 |
| 16 | 10.14 | 15.2381 | 16681.45 | 169149.9 | 162.24 | 1645.114 | 16 |
| 8 | 11.3 | 6.896552 | 11543.18 | 130437.9 | 90.4 | 1021.52 | 8 |
| 4 | 12.37 | 3.738318 | 7571.276 | 93656.69 | 49.48 | 612.0676 | 4 |
| 3 | 13.31 | 3.191489 | 7073.843 | 94152.85 | 39.93 | 531.4683 | 3 |
| 4 | 14.31 | 4 | 11721.38 | 167733 | 57.24 | 819.1044 | 4 |
| 1 | 15.38 | 0.934579 | 3638.053 | 55953.25 | 15.38 | 236.5444 | 1 |
| 2 | 16.54 | 1.724138 | 9049.749 | 149682.8 | 33.08 | 547.1432 | 2 |
| 1 | 17.46 | 1.086957 | 5322.709 | 92934.5 | 17.46 | 304.8516 | 1 |
| 0 | 18.44 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 19.47 | 0.970874 | 7380.705 | 143702.3 | 19.47 | 379.0809 | 1 |
| 2 | 20.56 | 1.834862 | 17381.98 | 357373.6 | 41.12 | 845.4272 | 2 |
| 1 | 22.51 | 0.512821 | 11405.82 | 256745 | 22.51 | 506.7001 | 1 |
| | sum = | | 297123.7 | 2888990 | 5932.7 | 38740 | 1000 |
| | | | | m1 | m2 | | m0 |

C.V= 0.317276

mass mean=11.60984 μ m ma#55.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $\ln(L)dL$ | $L^2n(L)dL$ |
|------|-------|----------|-------------|-------------|------------|-------------|
| 409 | 4.02 | 1168.571 | 26570.6 | 106813.8 | 1644.18 | 6609.602 |
| 1252 | 5 | 1277.551 | 156500 | 782500 | 6260 | 31300 |
| 969 | 5.99 | 978.7878 | 208259.2 | 1247472 | 5804.309 | 34767.81 |
| 540 | 7.05 | 509.4339 | 189217.4 | 1333982 | 3807 | 26839.35 |
| 331 | 8.01 | 344.7916 | 170108.3 | 1362567 | 2651.31 | 21236.99 |
| 234 | 9.09 | 216.6666 | 175754.9 | 1597612 | 2127.06 | 19334.97 |
| 153 | 10.14 | 145.7142 | 159516.3 | 1617496 | 1551.419 | 15731.39 |
| 85 | 11.1 | 88.54166 | 116248.6 | 1290359 | 943.4997 | 10472.85 |
| 62 | 12.15 | 59.04761 | 111204 | 1351128 | 753.2998 | 9152.593 |
| 42 | 13.07 | 45.65217 | 93772.62 | 1225608 | 548.94 | 7174.646 |
| 33 | 14.05 | 33.67346 | 91525.66 | 1285935 | 463.65 | 6514.282 |
| 25 | 15.11 | 23.5849 | 86244.89 | 1303160 | 377.75 | 5707.802 |
| 24 | 16.24 | 21.23893 | 102794.3 | 1669380 | 389.7597 | 6329.698 |
| 17 | 17.15 | 18.68131 | 85751.41 | 1470636 | 291.55 | 5000.082 |
| 9 | 18.11 | 9.375 | 53456.17 | 968091.2 | 162.99 | 2951.749 |
| 10 | 19.12 | 9.90099 | 69897.82 | 1336446 | 191.2 | 3655.744 |
| 5 | 20.19 | 4.672897 | 41150.86 | 830835.9 | 100.95 | 2038.18 |
| 5 | 21.32 | 4.424778 | 48454.21 | 1033043 | 106.6 | 2272.712 |
| 0 | 22.1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 22.92 | 0 | 0 | 0 | 0 | 0 |
| 7 | 24.2 | 5.46875 | 99207.41 | 2400819 | 169.4 | 4099.48 |
| sum= | 4212 | | 2085635 | 24213884 | 28344.87 | 221189.9 |
| m0 | | | | m1 | m2 | |

C.V= 0.399489

mass mean = 27.92653 μm MS#61.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $Ln(L)dL$ | $L^2n(L)dL$ | $n(L)dL$ |
|------|----------|----------|-------------|-------------|-----------|-------------|----------|
| 207 | 8.01 | 131.0126 | 106381.9 | 852119.3 | 1658.069 | 13281.14 | 206.9999 |
| 619 | 10.14 | 290.6103 | 645363.6 | 6543987 | 6276.659 | 63645.33 | 618.9999 |
| 235 | 12 | 126.344 | 406080 | 4872960 | 2820 | 33840 | 235 |
| 157 | 14.2 | 71.36363 | 449536.2 | 6383414 | 2229.4 | 31657.48 | 157 |
| 85 | 16.25 | 41.46341 | 364736.3 | 5926965 | 1381.25 | 22445.31 | 84.99999 |
| 58 | 18.28 | 28.57142 | 354288.1 | 6476386 | 1060.24 | 19381.19 | 58 |
| 50 | 20.23 | 25.64102 | 413959.3 | 8374396 | 1011.5 | 20462.64 | 50 |
| 25 | 22.01 | 14.04494 | 266563.1 | 5867055 | 550.2499 | 12111 | 24.99999 |
| 18 | 23.95 | 9.27835 | 247280 | 5922356 | 431.0999 | 10324.84 | 18 |
| 18 | 26.05 | 8.571428 | 318196.7 | 8289024 | 468.9 | 12214.84 | 18 |
| 17 | 28.34 | 7.42358 | 386944.3 | 10966001 | 481.78 | 13653.65 | 17 |
| 14 | 30.32 | 7.070707 | 390225.4 | 11831636 | 424.4799 | 12870.23 | 14 |
| 8 | 32.43 | 3.791469 | 272854.3 | 8848665 | 259.44 | 8413.639 | 7.999999 |
| 9 | 34.12 | 5.325443 | 357494.6 | 12197718 | 307.0799 | 10477.57 | 8.999998 |
| 9 | 36.5 | 3.781512 | 437644.1 | 15974010 | 328.5 | 11990.25 | 8.999999 |
| 9 | 38.39 | 4.761904 | 509209.9 | 19548568 | 345.51 | 13264.13 | 9 |
| 2 | 40.38 | 1.005025 | 131682.7 | 5317350 | 80.75996 | 3261.087 | 1.999999 |
| 4 | 42.47 | 1.913875 | 306412.7 | 13013347 | 169.88 | 7214.803 | 4 |
| 4 | 44.68 | 1.809954 | 356779.1 | 15940893 | 178.72 | 7985.208 | 3.999999 |
| 4 | 46.21 | 2.614379 | 394700.7 | 18239119 | 184.84 | 8541.456 | 4 |
| 2 | 48.61 | 0.833333 | 229724.2 | 11166896 | 97.21998 | 4725.863 | 1.999999 |
| 1 | 49.43 | 1.219512 | 120773.5 | 5969836 | 49.42998 | 2443.324 | 1 |
| | | sum = | 7466831 | 2.09E+08 | 20795.01 | 344205 | 1555 |
| | | | | m1 | m2 | m0 | |
| C.V= | 0.487586 | | | | | | |

mass mean = 20.68822 μm MS#62.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $Ln(L)dL$ | $L^2n(L)dL$ | $n(L)dL$ |
|------|----------|----------|-------------|-------------|-----------|-------------|----------|
| 124 | 8.01 | 78.48101 | 63726.37 | 510448.2 | 993.2399 | 7955.851 | 124 |
| 306 | 10.14 | 143.6619 | 319032.7 | 3234992 | 3102.839 | 31462.79 | 305.9999 |
| 155 | 12 | 83.33333 | 267840 | 3214080 | 1860 | 22320 | 155 |
| 141 | 13.96 | 71.93877 | 383597.1 | 5355016 | 1968.36 | 27478.3 | 141 |
| 76 | 15.98 | 37.62376 | 310130 | 4955878 | 1214.48 | 19407.38 | 75.99998 |
| 47 | 17.98 | 23.5 | 273191.3 | 4911980 | 845.0599 | 15194.18 | 46.99999 |
| 28 | 20.23 | 12.44444 | 231817.2 | 4689662 | 566.44 | 11459.08 | 28 |
| 11 | 22.01 | 6.179775 | 117287.7 | 2581504 | 242.1098 | 5328.837 | 10.99999 |
| 7 | 23.95 | 3.608247 | 96164.45 | 2303138 | 167.65 | 4015.217 | 6.999999 |
| 8 | 25.19 | 6.451612 | 127871.7 | 3221088 | 201.52 | 5076.288 | 7.999999 |
| 5 | 26.94 | 2.857142 | 97760.35 | 2633664 | 134.7 | 3628.818 | 5 |
| 5 | 28.82 | 2.659574 | 119688.3 | 3449418 | 144.0999 | 4152.96 | 4.999997 |
| 4 | 30.83 | 1.990049 | 117214.2 | 3613716 | 123.3199 | 3801.953 | 3.999997 |
| 0 | 32.98 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 34.7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 36.5 | 1.666666 | 145881.3 | 5324670 | 109.4999 | 3996.748 | 2.999998 |
| 1 | 38.39 | 0.5291 | 56578.87 | 2172063 | 38.38999 | 1473.792 | 1 |
| 2 | 40.38 | 1.005025 | 131682.7 | 5317350 | 80.75996 | 3261.087 | 1.999999 |
| 1 | 42.47 | 0.478468 | 76603.17 | 3253336 | 42.47 | 1803.701 | 1 |
| | | sum = | 2936067 | 60742003 | 11834.94 | 171817 | 923.9999 |
| | | | | m1 | m2 | m0 | |
| C.V= | 0.365321 | | | | | | |

mass mean=17.14258 μ m MS#63.dat

| N | L | n(L) | L^3n(L)dL | L^4n(L)dL | Ln(L)dL | L^2n(L)dL | n(L)dL |
|------|-------|----------|-----------|-----------|----------|-----------|----------|
| 844 | 8.01 | 534.1772 | 433750.5 | 3474341 | 6760.44 | 54151.12 | 844 |
| 2080 | 10.14 | 976.5258 | 2168588 | 21989489 | 21091.19 | 213864.7 | 2079.999 |
| 809 | 12 | 434.9462 | 1397952 | 16775424 | 9708 | 116496 | 809 |
| 183 | 13.96 | 93.36734 | 497860.1 | 6950127 | 2554.68 | 35663.33 | 183 |
| 87 | 15.98 | 43.0693 | 355017.3 | 5673177 | 1390.26 | 22216.35 | 86.99999 |
| 43 | 17.98 | 21.5 | 249941 | 4493939 | 773.14 | 13901.06 | 43 |
| 35 | 20.23 | 15.55555 | 289771.5 | 5862077 | 708.05 | 14323.85 | 35 |
| 14 | 22.01 | 7.865168 | 149275.3 | 3285550 | 308.1399 | 6782.158 | 13.99999 |
| 13 | 23.95 | 6.70103 | 178591.1 | 4277257 | 311.3499 | 7456.831 | 13 |
| 11 | 26.05 | 5.238095 | 194453.5 | 5065514 | 286.5499 | 7464.626 | 11 |
| 4 | 28.34 | 1.746724 | 91045.71 | 2580235 | 113.36 | 3212.622 | 4 |
| 2 | 30.32 | 1.010101 | 55746.49 | 1690233 | 60.63999 | 1838.605 | 2 |
| 3 | 32.43 | 1.4218 | 102320.3 | 3318249 | 97.28993 | 3155.113 | 2.999998 |
| 1 | 34.12 | 0.591715 | 39721.63 | 1355302 | 34.12 | 1164.174 | 1 |
| 2 | 36.5 | 0.840336 | 97254.25 | 3549780 | 73 | 2664.5 | 2 |
| 2 | 38.39 | 1.058201 | 113157.7 | 4344126 | 76.77996 | 2947.583 | 1.999999 |
| 0 | 40.38 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 42.47 | 0.956937 | 153206.3 | 6506673 | 84.93997 | 3607.401 | 1.999999 |
| 2 | 44.68 | 0.904977 | 178389.5 | 7970446 | 89.35996 | 3992.603 | 1.999999 |
| 1 | 46.21 | 0.653594 | 98675.17 | 4559779 | 46.21 | 2135.364 | 1 |
| 1 | 48.61 | 0.416666 | 114862.1 | 5583448 | 48.60999 | 2362.931 | 1 |
| | | sum = | 6959579 | 1.19E+08 | 44616.11 | 519400.9 | 4138.999 |
| | | | | m1 | m2 | m0 | |

C.V= 0.282803

mass mean=11.18178 μ m MS#70.dat

| N | L | n(L) | L^3n(L)dL | L^4n(L)dL | Ln(L)dL | L^2n(L)dL | n(L)dL |
|-----|-------|----------|-----------|-----------|----------|-----------|----------|
| 586 | 5 | 440.6015 | 73250 | 366250 | 2930 | 14650 | 586 |
| 162 | 6.1 | 147.2727 | 36770.92 | 224302.6 | 988.1998 | 6028.019 | 162 |
| 73 | 7.05 | 76.8421 | 25579.39 | 180334.7 | 514.65 | 3628.282 | 73 |
| 36 | 8.01 | 37.5 | 18501.21 | 148194.7 | 288.36 | 2309.764 | 36 |
| 30 | 9.09 | 27.77777 | 22532.68 | 204822 | 272.6999 | 2478.842 | 29.99999 |
| 24 | 10.14 | 22.85714 | 25022.17 | 253724.9 | 243.36 | 2467.67 | 24 |
| 18 | 11.1 | 18.75 | 24617.36 | 273252.7 | 199.8 | 2217.78 | 18 |
| 15 | 12.15 | 14.28571 | 26904.19 | 326885.9 | 182.2499 | 2214.337 | 15 |
| 10 | 13.07 | 10.86956 | 22326.8 | 291811.3 | 130.6999 | 1708.248 | 9.999995 |
| 10 | 14.05 | 10.20408 | 27735.05 | 389677.4 | 140.5 | 1974.025 | 9.999998 |
| 12 | 15.11 | 11.32075 | 41397.53 | 625516.7 | 181.3199 | 2739.744 | 11.99999 |
| 4 | 16.24 | 3.539823 | 17132.39 | 278230.1 | 64.96 | 1054.95 | 4 |
| 6 | 17.15 | 6.593406 | 30265.2 | 519048.2 | 102.9 | 1764.735 | 5.999999 |
| 4 | 18.11 | 4.166666 | 23758.3 | 430262.7 | 72.43999 | 1311.888 | 3.999999 |
| 1 | 19.12 | 0.990099 | 6989.782 | 133644.6 | 19.12 | 365.5744 | 1 |
| 1 | 20.56 | 0.694444 | 8690.986 | 178686.7 | 20.55999 | 422.7133 | 0.999999 |
| | | sum = | 431474 | 4824645 | 6351.819 | 47336.57 | 991.9999 |
| | | | | m1 | m2 | m0 | |

C.V= 0.404834

| | | mass mean= | 50.95439 μ m | MS#6.dat | | | |
|-------|-------|------------|------------------|-----------|----------|-----------|----------|
| N | L | n(L) | L^3n(L)dL | L^4n(L)dL | Ln(L)dL | L^2n(L)dL | n(L)dL |
| 754 | 10.03 | 390.6735 | 760806.3 | 7630887 | 7562.619 | 75853.07 | 753.9999 |
| 1776 | 12.18 | 826.0465 | 3209111 | 39086979 | 21631.68 | 263473.8 | 1776 |
| 1190 | 13.95 | 672.3163 | 3230498 | 45065458 | 16600.5 | 231576.9 | 1190 |
| 1442 | 15.98 | 710.3448 | 5884310 | 94031282 | 23043.16 | 368229.7 | 1442 |
| 1229 | 17.95 | 623.8578 | 7107964 | 1.3E+08 | 22060.55 | 395986.9 | 1229 |
| 562 | 20.17 | 253.1531 | 4611625 | 93016481 | 11335.54 | 228637.8 | 562 |
| 237 | 22.22 | 115.6097 | 2600042 | 57772952 | 5266.138 | 117013.6 | 236.9999 |
| 167 | 24.02 | 92.77777 | 2314384 | 555915111 | 4011.339 | 96352.37 | 167 |
| 87 | 25.96 | 44.84536 | 1522065 | 39512818 | 2258.519 | 58631.16 | 86.99998 |
| 83 | 28.6 | 31.43939 | 1941673 | 55531860 | 2373.799 | 67890.66 | 82.99998 |
| 37 | 30.32 | 21.51162 | 1031310 | 31269325 | 1121.84 | 34014.18 | 36.99999 |
| 61 | 32.77 | 24.89795 | 2146639 | 70345383 | 1998.969 | 65506.23 | 60.99998 |
| 41 | 34.73 | 20.91836 | 1717505 | 59648975 | 1423.929 | 49453.07 | 40.99998 |
| 30 | 36.82 | 14.35406 | 1497519 | 55138683 | 1104.599 | 40671.35 | 29.99998 |
| 33 | 39.02 | 15 | 1960540 | 76500275 | 1287.66 | 50244.49 | 33 |
| 30 | 41.36 | 12.82051 | 2122574 | 87789661 | 1240.8 | 51319.49 | 30 |
| 18 | 43.84 | 7.258064 | 1516645 | 66489748 | 789.1196 | 34595 | 17.99999 |
| 16 | 45.58 | 9.195402 | 1515105 | 69058519 | 729.2796 | 33240.57 | 15.99999 |
| 11 | 47.38 | 6.111111 | 1169978 | 55433577 | 521.1798 | 24693.5 | 11 |
| 18 | 49.26 | 9.574468 | 2151571 | 1.1E+08 | 886.6799 | 43677.85 | 18 |
| 9 | 51.21 | 4.615384 | 1208667 | 61895861 | 460.8898 | 23602.17 | 8.999996 |
| 2 | 53.24 | 0.985221 | 301817.3 | 16068753 | 106.48 | 5668.995 | 2 |
| 13 | 55.34 | 6.190476 | 2203234 | 1.2E+08 | 719.4197 | 39812.69 | 12.99999 |
| 13 | 57.53 | 5.936073 | 2475292 | 1.4E+08 | 747.8899 | 43026.11 | 13 |
| 17 | 59.81 | 7.456124 | 3637226 | 2.2E+08 | 1016.77 | 60813.01 | 17 |
| 16 | 62.18 | 6.751054 | 3846556 | 2.4E+08 | 994.8798 | 61861.63 | 16 |
| 11 | 64.64 | 4.471544 | 2970959 | 1.9E+08 | 711.0399 | 45961.62 | 11 |
| 6 | 67.2 | 2.34375 | 1820768 | 1.2E+08 | 403.1998 | 27095.03 | 5.999998 |
| 12 | 69.86 | 4.511278 | 4091353 | 2.9E+08 | 838.3199 | 58565.03 | 12 |
| 13 | 72.62 | 4.710144 | 4978655 | 3.6E+08 | 944.0599 | 68557.63 | 13 |
| 4 | 74.05 | 2.797202 | 1624183 | 1.2E+08 | 296.1999 | 21933.6 | 3.999998 |
| 1 | 75.5 | 0.689655 | 430368.8 | 32492850 | 75.49999 | 5700.249 | 1 |
| 6 | 76.98 | 4.054054 | 2737064 | 2.1E+08 | 461.88 | 35555.52 | 6 |
| 8 | 78.49 | 5.298013 | 3868414 | 3E+08 | 627.92 | 49285.44 | 7.999999 |
| 3 | 80.03 | 1.948051 | 1537728 | 1.2E+08 | 240.0899 | 19214.39 | 2.999999 |
| 3 | 81.59 | 1.923076 | 1629416 | 1.3E+08 | 244.77 | 19970.78 | 2.999999 |
| 3 | 83.19 | 1.875 | 1727168 | 1.4E+08 | 249.57 | 20761.73 | 3 |
| 2 | 84.82 | 1.226993 | 1220463 | 1E+08 | 169.6399 | 14388.86 | 1.999999 |
| 3 | 86.49 | 1.796407 | 1940970 | 1.7E+08 | 259.4699 | 22441.55 | 2.999999 |
| 3 | 88.18 | 1.775147 | 2056986 | 1.8E+08 | 264.5399 | 23327.13 | 2.999999 |
| 0 | 89.91 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 91.67 | 1.704545 | 2311015 | 2.1E+08 | 275.0099 | 25210.16 | 2.999999 |
| 2 | 93.47 | 1.111111 | 1633227 | 1.5E+08 | 186.9399 | 17473.27 | 1.999999 |
| 5 | 95.3 | 2.73224 | 4327615 | 4.1E+08 | 476.4999 | 45410.44 | 4.999999 |
| sum = | | 1.05E+08 | 5.33E+09 | 138018.9 | 3086699 | 7979.999 | |
| | | | | m1 | m2 | m0 | |

mass mean = 15.9563 μ m MS#75.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $Ln(L)dL$ | $L^2n(L)dL$ | $n(L)dL$ |
|----|-------|----------|-------------|-------------|-----------|-------------|----------|
| 66 | 5 | 49.62406 | 8250 | 41250 | 330 | 1650 | 66 |
| 56 | 6.1 | 50.90909 | 12710.93 | 77536.7 | 341.5998 | 2083.759 | 55.99997 |
| 33 | 7.05 | 34.73684 | 11563.28 | 81521.17 | 232.6499 | 1640.182 | 32.99998 |
| 12 | 8.01 | 12.5 | 6167.068 | 49398.22 | 96.11999 | 769.9211 | 12 |
| 17 | 9.09 | 15.74074 | 12768.52 | 116065.8 | 154.53 | 1404.678 | 17 |
| 13 | 10.14 | 12.38095 | 13553.67 | 137434.3 | 131.8199 | 1336.654 | 12.99999 |
| 7 | 11.1 | 7.291666 | 9573.417 | 106264.9 | 77.7 | 862.47 | 7 |
| 6 | 12.15 | 5.714285 | 10761.68 | 130754.4 | 72.9 | 885.735 | 6 |
| 2 | 13.07 | 2.173913 | 4465.362 | 58362.29 | 26.13999 | 341.6497 | 2 |
| 4 | 14.05 | 4.081632 | 11094.02 | 155870.9 | 56.2 | 789.61 | 4 |
| 4 | 15.11 | 3.773584 | 13799.18 | 208505.6 | 60.43999 | 913.2482 | 3.999999 |
| 3 | 16.24 | 2.654867 | 12849.29 | 208672.5 | 48.71998 | 791.2124 | 2.999999 |
| 6 | 17.15 | 6.593406 | 30265.2 | 519048.2 | 102.9 | 1764.735 | 5.999999 |
| 1 | 18.11 | 1.041666 | 5939.574 | 107565.6 | 18.11 | 327.9721 | 1 |
| 1 | 19.12 | 0.990099 | 6989.782 | 133644.6 | 19.12 | 365.5744 | 1 |
| 3 | 20.19 | 2.803738 | 24690.51 | 498501.5 | 60.56998 | 1222.908 | 2.999999 |
| 0 | 21.32 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 22.1 | 3.846153 | 32381.58 | 715632.9 | 66.29999 | 1465.23 | 3 |
| 0 | 23.34 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 24.2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 25.1 | 2.222222 | 31626.5 | 793825.2 | 50.2 | 1260.02 | 2 |
| | | sum = | 259449.6 | 4139855 | 1946.019 | 19875.56 | 238.9999 |
| | | | | m1 | m2 | m0 | |

C.V= 0.504343

mass mean=13.74662 μ m MS#80.dat

| N | L | n(L) | $L^3n(L)dL$ | $L^4n(L)dL$ | $Ln(L)dL$ | $L^2n(L)dL$ | $n(L)dL$ |
|----|-------|----------|-------------|-------------|-----------|-------------|----------|
| 78 | 5 | 58.64661 | 9750 | 48750 | 390 | 1950 | 78 |
| 69 | 6.1 | 62.72727 | 15661.68 | 95536.3 | 420.8998 | 2567.489 | 68.99996 |
| 39 | 7.05 | 41.05263 | 13665.7 | 96343.2 | 274.95 | 1938.397 | 38.99999 |
| 17 | 8.01 | 17.70833 | 8736.68 | 69980.81 | 136.17 | 1090.722 | 17 |
| 14 | 9.09 | 12.96296 | 10515.25 | 95583.64 | 127.26 | 1156.793 | 14 |
| 4 | 10.14 | 3.809523 | 4170.362 | 42287.48 | 40.55999 | 411.2783 | 3.999999 |
| 4 | 11.1 | 4.166666 | 5470.524 | 60722.81 | 44.4 | 492.84 | 4 |
| 4 | 12.15 | 3.809523 | 7174.453 | 87169.61 | 48.6 | 590.49 | 4 |
| 1 | 13.07 | 1.086956 | 2232.681 | 29181.14 | 13.07 | 170.8249 | 1 |
| 3 | 14.05 | 3.061224 | 8320.515 | 116903.2 | 42.15 | 592.2075 | 3 |
| 2 | 15.11 | 1.886792 | 6899.591 | 104252.8 | 30.22 | 456.6242 | 2 |
| 0 | 16.24 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 17.15 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 18.11 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 19.12 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 20.19 | 1.869158 | 16460.34 | 332334.3 | 40.37999 | 815.2719 | 1.999999 |
| 3 | 21.32 | 2.654867 | 29072.53 | 619826.3 | 63.96 | 1363.627 | 3 |
| 1 | 22.51 | 0.840336 | 11405.81 | 256744.9 | 22.50998 | 506.6997 | 0.999999 |
| | | sum = | 149536.1 | 2055616 | 1695.13 | 14103.26 | 240.9999 |
| | | | | m1 | m2 | m0 | |

C.V = 0.427613

| Acetaminophen ORIGINAL CRYSTALS | | | | | | | |
|---------------------------------|-------|--------|---------|------|-------|--------|---------|
| chnl | size | counts | %larger | chnl | size | counts | %larger |
| 2 | 6.54 | 226 | 100 | 34 | 11.21 | 1643 | 40.87 |
| 3 | 6.65 | 1237 | 99.77 | 35 | 11.4 | 1553 | 39.23 |
| 4 | 6.76 | 1647 | 98.54 | 36 | 11.6 | 1527 | 37.68 |
| 5 | 6.88 | 1717 | 96.89 | 37 | 11.8 | 1540 | 36.15 |
| 6 | 7 | 1799 | 95.17 | 38 | 12 | 1531 | 34.61 |
| 7 | 7.11 | 1839 | 93.37 | 39 | 12.2 | 1445 | 33.08 |
| 8 | 7.24 | 1800 | 91.54 | 40 | 12.41 | 1372 | 31.63 |
| 9 | 7.36 | 1948 | 89.74 | 41 | 12.62 | 1356 | 30.26 |
| 10 | 7.48 | 1955 | 87.79 | 42 | 12.83 | 1311 | 28.91 |
| 11 | 7.61 | 2004 | 85.83 | 43 | 13.05 | 1255 | 27.6 |
| 12 | 7.74 | 1956 | 83.83 | 44 | 13.27 | 1206 | 26.34 |
| 13 | 7.87 | 2015 | 81.87 | 45 | 13.5 | 1198 | 25.13 |
| 14 | 8.01 | 2042 | 79.86 | 46 | 13.73 | 1138 | 23.94 |
| 15 | 8.14 | 1960 | 77.82 | 47 | 13.96 | 1105 | 22.8 |
| 16 | 8.28 | 2083 | 75.86 | 48 | 14.2 | 1068 | 21.69 |
| 17 | 8.42 | 2134 | 73.77 | 49 | 14.44 | 1016 | 20.63 |
| 18 | 8.56 | 2071 | 71.64 | 50 | 14.68 | 1019 | 19.61 |
| 19 | 8.71 | 2060 | 69.57 | 51 | 14.93 | 972 | 18.59 |
| 20 | 8.86 | 2038 | 67.51 | 52 | 15.19 | 919 | 17.62 |
| 21 | 9.01 | 2028 | 65.47 | 53 | 15.45 | 965 | 16.7 |
| 22 | 9.16 | 1977 | 63.44 | 54 | 15.71 | 901 | 15.73 |
| 23 | 9.32 | 2060 | 61.46 | 55 | 15.98 | 778 | 14.83 |
| 24 | 9.48 | 1998 | 59.4 | 56 | 16.25 | 824 | 14.06 |
| 25 | 9.64 | 1985 | 57.41 | 57 | 16.52 | 758 | 13.23 |
| 26 | 9.8 | 1903 | 55.42 | 58 | 16.81 | 724 | 12.47 |
| 27 | 9.97 | 1961 | 53.52 | 59 | 17.09 | 693 | 11.75 |
| 28 | 10.14 | 1877 | 51.56 | 60 | 17.38 | 680 | 11.06 |
| 29 | 10.31 | 1820 | 49.68 | 61 | 17.68 | 659 | 10.38 |
| 30 | 10.48 | 1774 | 47.86 | 62 | 17.98 | 629 | 9.72 |
| 31 | 10.66 | 1770 | 46.09 | 63 | 18.28 | 569 | 9.09 |
| 32 | 10.84 | 1766 | 44.32 | 64 | 18.6 | 507 | 8.52 |
| 33 | 11.03 | 1677 | 42.55 | 65 | 18.91 | 551 | 8.01 |
| chnl | size | counts | %larger | chnl | size | counts | %larger |
| 66 | 19.23 | 500 | 7.46 | 98 | 32.98 | 45 | 0.57 |
| 67 | 19.56 | 456 | 6.96 | 99 | 33.55 | 43 | 0.53 |
| 68 | 19.89 | 419 | 6.51 | 100 | 34.12 | 38 | 0.49 |
| 69 | 20.23 | 408 | 6.09 | 101 | 34.7 | 40 | 0.45 |
| 70 | 20.57 | 387 | 5.68 | 102 | 35.29 | 33 | 0.41 |
| 71 | 20.92 | 385 | 5.29 | 103 | 35.89 | 39 | 0.38 |
| 72 | 21.28 | 356 | 4.91 | 104 | 36.5 | 37 | 0.34 |
| 73 | 21.64 | 315 | 4.55 | 105 | 37.12 | 24 | 0.3 |
| 74 | 22.01 | 308 | 4.24 | 106 | 37.75 | 28 | 0.28 |
| 75 | 22.38 | 281 | 3.93 | 107 | 38.39 | 15 | 0.25 |
| 76 | 22.77 | 270 | 3.65 | 108 | 39.04 | 28 | 0.23 |
| 77 | 23.15 | 271 | 3.38 | 109 | 39.71 | 22 | 0.2 |
| 78 | 23.55 | 223 | 3.11 | 110 | 40.38 | 26 | 0.18 |
| 79 | 23.95 | 256 | 2.88 | 111 | 41.07 | 24 | 0.16 |
| 80 | 24.35 | 188 | 2.63 | 112 | 41.76 | 16 | 0.13 |
| 81 | 24.77 | 172 | 2.44 | 113 | 42.47 | 23 | 0.12 |
| 82 | 25.19 | 182 | 2.27 | 114 | 43.2 | 15 | 0.09 |
| 83 | 25.62 | 196 | 2.08 | 115 | 43.93 | 8 | 0.08 |
| 84 | 26.05 | 152 | 1.89 | 116 | 44.68 | 7 | 0.07 |
| 85 | 26.49 | 153 | 1.74 | 117 | 45.44 | 12 | 0.06 |
| 86 | 26.94 | 121 | 1.58 | 118 | 46.21 | 12 | 0.05 |
| 87 | 27.4 | 108 | 1.46 | 119 | 47 | 5 | 0.04 |
| 88 | 27.87 | 110 | 1.35 | 120 | 47.79 | 6 | 0.03 |
| 89 | 28.34 | 106 | 1.24 | 121 | 48.61 | 2 | 0.03 |
| 90 | 28.82 | 90 | 1.14 | 122 | 49.43 | 6 | 0.03 |
| 91 | 29.31 | 83 | 1.05 | 123 | 50.27 | 8 | 0.02 |
| 92 | 29.81 | 81 | 0.97 | 124 | 51.13 | 5 | 0.01 |
| 93 | 30.32 | 71 | 0.88 | 125 | 52 | 1 | 0.01 |
| 94 | 30.83 | 72 | 0.81 | 126 | 52.88 | 5 | 0.01 |
| 95 | 31.36 | 45 | 0.74 | 127 | 53.78 | 1 | 0 |
| 96 | 31.89 | 61 | 0.7 | 97 | 32.43 | 61 | 0.64 |

LAS PROCESS : 50 secs to 800 psi MS#29.dat

| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
|------|-------|--------|---------|------|-------|--------|---------|
| 2 | 6.54 | 320 | 100 | 28 | 10.08 | 2011 | 47.64 |
| 3 | 6.65 | 1628 | 99.68 | 29 | 10.25 | 1912 | 45.63 |
| 4 | 6.76 | 1942 | 98.05 | 30 | 10.42 | 1772 | 43.72 |
| 5 | 6.87 | 1832 | 96.11 | 31 | 10.6 | 1797 | 41.95 |
| 6 | 6.99 | 1868 | 94.28 | 32 | 10.78 | 1761 | 40.15 |
| 7 | 7.11 | 2016 | 92.41 | 33 | 10.96 | 1677 | 38.39 |
| 8 | 7.23 | 2031 | 90.39 | 34 | 11.14 | 1611 | 36.71 |
| 9 | 7.35 | 2017 | 88.36 | 35 | 11.33 | 1565 | 35.1 |
| 10 | 7.47 | 2057 | 86.35 | 36 | 11.52 | 1488 | 33.54 |
| 11 | 7.59 | 2114 | 84.29 | 37 | 11.71 | 1479 | 32.05 |
| 12 | 7.72 | 2167 | 82.18 | 38 | 11.91 | 1431 | 30.57 |
| 13 | 7.85 | 2239 | 80.01 | 39 | 12.11 | 1405 | 29.14 |
| 14 | 7.98 | 2192 | 77.77 | 40 | 12.31 | 1404 | 27.74 |
| 15 | 8.12 | 2191 | 75.58 | 41 | 12.52 | 1367 | 26.33 |
| 16 | 8.25 | 2234 | 73.39 | 42 | 12.73 | 1296 | 24.96 |
| 17 | 8.39 | 2199 | 71.15 | 43 | 12.94 | 1193 | 23.67 |
| 18 | 8.53 | 2203 | 68.95 | 44 | 13.16 | 1219 | 22.48 |
| 19 | 8.68 | 2226 | 66.75 | 45 | 13.38 | 1123 | 21.26 |
| 20 | 8.82 | 2240 | 64.52 | 46 | 13.6 | 1054 | 20.13 |
| 21 | 8.97 | 2170 | 62.28 | 47 | 13.83 | 1050 | 19.08 |
| 22 | 9.12 | 2100 | 60.11 | 48 | 14.07 | 1129 | 18.03 |
| 23 | 9.28 | 2087 | 58.01 | 49 | 14.3 | 1016 | 16.9 |
| 24 | 9.43 | 2187 | 55.93 | 50 | 14.54 | 926 | 15.88 |
| 25 | 9.59 | 2088 | 53.74 | 51 | 14.79 | 922 | 14.96 |
| 26 | 9.75 | 2036 | 51.65 | 52 | 15.03 | 864 | 14.04 |
| 27 | 9.91 | 1972 | 49.62 | 53 | 15.29 | 845 | 13.17 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 54 | 15.54 | 759 | 12.33 | 80 | 23.97 | 114 | 0.87 |
| 55 | 15.8 | 742 | 11.57 | 81 | 24.37 | 103 | 0.76 |
| 56 | 16.07 | 686 | 10.83 | 82 | 24.78 | 92 | 0.65 |
| 57 | 16.34 | 726 | 10.14 | 83 | 25.2 | 92 | 0.56 |
| 58 | 16.62 | 660 | 9.41 | 84 | 25.62 | 59 | 0.47 |
| 59 | 16.89 | 677 | 8.75 | 85 | 26.05 | 73 | 0.41 |
| 60 | 17.18 | 619 | 8.08 | 86 | 26.49 | 49 | 0.34 |
| 61 | 17.47 | 588 | 7.46 | 87 | 26.93 | 57 | 0.29 |
| 62 | 17.76 | 546 | 6.87 | 88 | 27.38 | 32 | 0.23 |
| 63 | 18.06 | 504 | 6.32 | 89 | 27.84 | 35 | 0.2 |
| 64 | 18.36 | 494 | 5.82 | 90 | 28.31 | 37 | 0.16 |
| 65 | 18.67 | 492 | 5.33 | 91 | 28.79 | 34 | 0.13 |
| 66 | 18.98 | 446 | 4.83 | 92 | 29.27 | 12 | 0.09 |
| 67 | 19.3 | 405 | 4.39 | 93 | 29.76 | 19 | 0.08 |
| 68 | 19.63 | 394 | 3.98 | 94 | 30.26 | 15 | 0.06 |
| 69 | 19.96 | 356 | 3.59 | 95 | 30.77 | 14 | 0.05 |
| 70 | 20.29 | 345 | 3.23 | 96 | 31.29 | 6 | 0.03 |
| 71 | 20.63 | 305 | 2.89 | 97 | 31.82 | 8 | 0.03 |
| 72 | 20.98 | 319 | 2.58 | 98 | 32.35 | 10 | 0.02 |
| 73 | 21.33 | 309 | 2.26 | 99 | 32.89 | 0 | 0.01 |
| 74 | 21.69 | 223 | 1.96 | 100 | 33.45 | 1 | 0.01 |
| 75 | 22.05 | 220 | 1.73 | 101 | 34.01 | 3 | 0.01 |
| 76 | 22.42 | 185 | 1.51 | 102 | 34.58 | 2 | 0 |
| 77 | 22.8 | 165 | 1.33 | 103 | 35.16 | 1 | 0 |
| 78 | 23.18 | 165 | 1.16 | 104 | 35.75 | 0 | 0 |
| 79 | 23.57 | 128 | 1 | 105 | 36.35 | 1 | 0 |

| LAS PROCESS: 50 sec to 800 psi MSF30.dat | | | | | | | |
|--|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 2 | 6.54 | 8 | 100 | 32 | 10.84 | 31 | 54.99 |
| 3 | 6.65 | 21 | 99.62 | 33 | 11.03 | 28 | 53.5 |
| 4 | 6.76 | 45 | 98.61 | 34 | 11.21 | 29 | 52.16 |
| 5 | 6.88 | 33 | 96.45 | 35 | 11.4 | 30 | 50.77 |
| 6 | 7 | 34 | 94.87 | 36 | 11.6 | 30 | 49.33 |
| 7 | 7.11 | 35 | 93.23 | 37 | 11.8 | 29 | 47.89 |
| 8 | 7.24 | 34 | 91.55 | 38 | 12 | 42 | 46.5 |
| 9 | 7.36 | 36 | 89.92 | 39 | 12.2 | 60 | 44.48 |
| 10 | 7.48 | 33 | 88.2 | 40 | 12.41 | 71 | 41.6 |
| 11 | 7.61 | 33 | 86.61 | 41 | 12.62 | 68 | 38.2 |
| 12 | 7.74 | 34 | 85.03 | 42 | 12.83 | 50 | 34.93 |
| 13 | 7.87 | 33 | 83.4 | 43 | 13.05 | 41 | 32.53 |
| 14 | 8.01 | 33 | 81.81 | 44 | 13.27 | 35 | 30.57 |
| 15 | 8.14 | 31 | 80.23 | 45 | 13.5 | 34 | 28.89 |
| 16 | 8.28 | 31 | 78.74 | 46 | 13.73 | 32 | 27.26 |
| 17 | 8.42 | 30 | 77.26 | 47 | 13.96 | 32 | 25.72 |
| 18 | 8.56 | 30 | 75.82 | 48 | 14.2 | 31 | 24.18 |
| 19 | 8.71 | 29 | 74.38 | 49 | 14.44 | 28 | 22.7 |
| 20 | 8.86 | 31 | 72.98 | 50 | 14.68 | 28 | 21.35 |
| 21 | 9.01 | 32 | 71.5 | 51 | 14.93 | 25 | 20.01 |
| 22 | 9.16 | 30 | 69.96 | 52 | 15.19 | 22 | 18.81 |
| 23 | 9.32 | 30 | 68.52 | 53 | 15.45 | 19 | 17.75 |
| 24 | 9.48 | 31 | 67.08 | 54 | 15.71 | 20 | 16.84 |
| 25 | 9.64 | 35 | 65.6 | 55 | 15.98 | 19 | 15.88 |
| 26 | 9.8 | 36 | 63.92 | 56 | 16.25 | 20 | 14.97 |
| 27 | 9.97 | 33 | 62.19 | 57 | 16.52 | 19 | 14.01 |
| 28 | 10.14 | 29 | 60.6 | 58 | 16.81 | 17 | 13.1 |
| 29 | 10.31 | 27 | 59.21 | 59 | 17.09 | 17 | 12.28 |
| 30 | 10.48 | 29 | 57.92 | 60 | 17.38 | 15 | 11.47 |
| 31 | 10.66 | 32 | 56.53 | 61 | 17.68 | 15 | 10.75 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 62 | 17.98 | 15 | 10.03 | 92 | 29.81 | 0 | 0.1 |
| 63 | 18.28 | 15 | 9.31 | 93 | 30.32 | 0 | 0.1 |
| 64 | 18.6 | 15 | 8.59 | 94 | 30.83 | 0 | 0.1 |
| 65 | 18.91 | 14 | 7.87 | 95 | 31.36 | 0 | 0.1 |
| 66 | 19.23 | 14 | 7.2 | 96 | 31.89 | 0 | 0.1 |
| 67 | 19.56 | 14 | 6.53 | 97 | 32.43 | 0 | 0.1 |
| 68 | 19.89 | 13 | 5.85 | 98 | 32.98 | 0 | 0.1 |
| 69 | 20.23 | 11 | 5.23 | 99 | 33.55 | 0 | 0.1 |
| 70 | 20.57 | 9 | 4.7 | 100 | 34.12 | 0 | 0.1 |
| 71 | 20.92 | 8 | 4.27 | 101 | 34.7 | 0 | 0.1 |
| 72 | 21.28 | 7 | 3.89 | 102 | 35.29 | 0 | 0.1 |
| 73 | 21.64 | 7 | 3.55 | 103 | 35.89 | 0 | 0.1 |
| 74 | 22.01 | 5 | 3.21 | 104 | 36.5 | 0 | 0.1 |
| 75 | 22.38 | 6 | 2.98 | 105 | 37.12 | 1 | 0.1 |
| 76 | 22.77 | 6 | 2.69 | 106 | 37.75 | 0 | 0.05 |
| 77 | 23.15 | 6 | 2.4 | 107 | 38.39 | 0 | 0.05 |
| 78 | 23.55 | 6 | 2.11 | 108 | 39.04 | 0 | 0.05 |
| 79 | 23.95 | 4 | 1.82 | 109 | 39.71 | 0 | 0.05 |
| 80 | 24.35 | 4 | 1.63 | 110 | 40.38 | 0 | 0.05 |
| 81 | 24.77 | 3 | 1.44 | 111 | 41.07 | 0 | 0.05 |
| 82 | 25.19 | 4 | 1.3 | 112 | 41.76 | 0 | 0.05 |
| 83 | 25.62 | 4 | 1.1 | 113 | 42.47 | 0 | 0.05 |
| 84 | 26.05 | 3 | 0.91 | 114 | 43.2 | 0 | 0.05 |
| 85 | 26.49 | 3 | 0.77 | 115 | 43.93 | 0 | 0.05 |
| 86 | 26.94 | 2 | 0.62 | 116 | 44.68 | 0 | 0.05 |
| 87 | 27.4 | 2 | 0.53 | 117 | 45.44 | 0 | 0.05 |
| 88 | 27.87 | 2 | 0.43 | 118 | 46.21 | 1 | 0.05 |
| 89 | 28.34 | 2 | 0.34 | | | | |
| 90 | 28.82 | 2 | 0.24 | | | | |
| 91 | 29.31 | 1 | 0.14 | | | | |

| LAS PROCESS: 30 min to 700 psi, 10 min to 800 psi MS#31.dat | | | | | | | |
|---|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 2 | 6.54 | 2 | 100 | 34 | 11.21 | 13 | 56.65 |
| 3 | 6.65 | 17 | 99.86 | 35 | 11.4 | 9 | 55.72 |
| 4 | 6.76 | 36 | 98.63 | 36 | 11.6 | 17 | 55.07 |
| 5 | 6.88 | 28 | 96.05 | 37 | 11.8 | 19 | 53.85 |
| 6 | 7 | 25 | 94.03 | 38 | 12 | 17 | 52.48 |
| 7 | 7.11 | 22 | 92.24 | 39 | 12.2 | 18 | 51.26 |
| 8 | 7.24 | 17 | 90.65 | 40 | 12.41 | 17 | 49.96 |
| 9 | 7.36 | 25 | 89.43 | 41 | 12.62 | 14 | 48.74 |
| 10 | 7.48 | 22 | 87.63 | 42 | 12.83 | 16 | 47.74 |
| 11 | 7.61 | 14 | 86.05 | 43 | 13.05 | 23 | 46.59 |
| 12 | 7.74 | 24 | 85.05 | 44 | 13.27 | 20 | 44.93 |
| 13 | 7.87 | 20 | 83.32 | 45 | 13.5 | 17 | 43.49 |
| 14 | 8.01 | 22 | 81.88 | 46 | 13.73 | 15 | 42.27 |
| 15 | 8.14 | 19 | 80.3 | 47 | 13.96 | 8 | 41.19 |
| 16 | 8.28 | 16 | 78.94 | 48 | 14.2 | 18 | 40.62 |
| 17 | 8.42 | 20 | 77.79 | 49 | 14.44 | 17 | 39.32 |
| 18 | 8.56 | 16 | 76.35 | 50 | 14.68 | 12 | 38.1 |
| 19 | 8.71 | 17 | 75.2 | 51 | 14.93 | 21 | 37.24 |
| 20 | 8.86 | 19 | 73.98 | 52 | 15.19 | 11 | 35.73 |
| 21 | 9.01 | 16 | 72.61 | 53 | 15.45 | 8 | 34.94 |
| 22 | 9.16 | 15 | 71.46 | 54 | 15.71 | 17 | 34.36 |
| 23 | 9.32 | 25 | 70.38 | 55 | 15.98 | 19 | 33.14 |
| 24 | 9.48 | 18 | 68.58 | 56 | 16.25 | 12 | 31.78 |
| 25 | 9.64 | 14 | 67.29 | 57 | 16.52 | 17 | 30.91 |
| 26 | 9.8 | 20 | 66.28 | 58 | 16.81 | 10 | 29.69 |
| 27 | 9.97 | 21 | 64.85 | 59 | 17.09 | 10 | 28.97 |
| 28 | 10.14 | 17 | 63.34 | 60 | 17.38 | 15 | 28.25 |
| 29 | 10.31 | 12 | 62.11 | 61 | 17.68 | 13 | 27.17 |
| 30 | 10.48 | 12 | 61.25 | 62 | 17.98 | 19 | 26.24 |
| 31 | 10.66 | 17 | 60.39 | 63 | 18.28 | 9 | 24.87 |
| 32 | 10.84 | 15 | 59.17 | 64 | 18.6 | 9 | 24.23 |
| 33 | 11.03 | 20 | 58.09 | 65 | 18.91 | 6 | 23.58 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 19.23 | 10 | 23.15 | 98 | 32.98 | 1 | 1.87 |
| 67 | 19.56 | 13 | 22.43 | 99 | 33.55 | 6 | 1.8 |
| 68 | 19.89 | 10 | 21.5 | 100 | 34.12 | 1 | 1.37 |
| 69 | 20.23 | 15 | 20.78 | 101 | 34.7 | 0 | 1.29 |
| 70 | 20.57 | 12 | 19.7 | 102 | 35.29 | 0 | 1.29 |
| 71 | 20.92 | 11 | 18.84 | 103 | 35.89 | 4 | 1.29 |
| 72 | 21.28 | 14 | 18.04 | 104 | 36.5 | 1 | 1.01 |
| 73 | 21.64 | 11 | 17.04 | 105 | 37.12 | 2 | 0.93 |
| 74 | 22.01 | 12 | 16.25 | 106 | 37.75 | 4 | 0.79 |
| 75 | 22.38 | 14 | 15.38 | 107 | 38.39 | 1 | 0.5 |
| 76 | 22.77 | 12 | 14.38 | 108 | 39.04 | 0 | 0.43 |
| 77 | 23.15 | 12 | 13.52 | 109 | 39.71 | 1 | 0.43 |
| 78 | 23.55 | 12 | 12.65 | 110 | 40.38 | 2 | 0.36 |
| 79 | 23.95 | 9 | 11.79 | 111 | 41.07 | 1 | 0.22 |
| 80 | 24.35 | 11 | 11.14 | 112 | 41.76 | 0 | 0.14 |
| 81 | 24.77 | 14 | 10.35 | 113 | 42.47 | 0 | 0.14 |
| 82 | 25.19 | 9 | 9.35 | 114 | 43.2 | 1 | 0.14 |
| 83 | 25.62 | 10 | 8.7 | 115 | 43.93 | 0 | 0.07 |
| 84 | 26.05 | 6 | 7.98 | 116 | 44.68 | 0 | 0.07 |
| 85 | 26.49 | 10 | 7.55 | 117 | 45.44 | 0 | 0.07 |
| 86 | 26.94 | 9 | 6.83 | 118 | 46.21 | 0 | 0.07 |
| 87 | 27.4 | 9 | 6.18 | 119 | 47 | 0 | 0.07 |
| 88 | 27.87 | 3 | 5.54 | 120 | 47.79 | 0 | 0.07 |
| 89 | 28.34 | 4 | 5.32 | 121 | 48.61 | 0 | 0.07 |
| 90 | 28.82 | 8 | 5.03 | 122 | 49.43 | 0 | 0.07 |
| 91 | 29.31 | 4 | 4.46 | 123 | 50.27 | 0 | 0.07 |
| 92 | 29.81 | 5 | 4.17 | 124 | 51.13 | 0 | 0.07 |
| 93 | 30.32 | 5 | 3.81 | 125 | 52 | 0 | 0.07 |
| 94 | 30.83 | 1 | 3.45 | 126 | 52.88 | 0 | 0.07 |
| 95 | 31.36 | 7 | 3.38 | 127 | 53.78 | 0 | 0.07 |
| 96 | 31.89 | 5 | 2.88 | 128 | 54.69 | 1 | 0.07 |
| 97 | 32.43 | 9 | 2.52 | | | | |

| LAS PROCESS: 10 min to 700 psi, 10 min to 800 psi MS/32.dat | | | | | | | |
|---|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 2 | 6.54 | 92 | 100 | 34 | 11.21 | 246 | 63.14 |
| 3 | 6.65 | 226 | 99.6 | 35 | 11.4 | 253 | 62.07 |
| 4 | 6.76 | 387 | 98.61 | 36 | 11.6 | 250 | 60.96 |
| 5 | 6.88 | 256 | 96.92 | 37 | 11.8 | 251 | 59.87 |
| 6 | 7 | 327 | 95.81 | 38 | 12 | 264 | 58.78 |
| 7 | 7.11 | 291 | 94.38 | 39 | 12.2 | 280 | 57.62 |
| 8 | 7.24 | 266 | 93.11 | 40 | 12.41 | 282 | 56.4 |
| 9 | 7.36 | 259 | 91.95 | 41 | 12.62 | 229 | 55.17 |
| 10 | 7.48 | 258 | 90.82 | 42 | 12.83 | 244 | 54.17 |
| 11 | 7.61 | 248 | 89.69 | 43 | 13.05 | 288 | 53.11 |
| 12 | 7.74 | 254 | 88.61 | 44 | 13.27 | 262 | 51.85 |
| 13 | 7.87 | 259 | 87.5 | 45 | 13.5 | 241 | 50.7 |
| 14 | 8.01 | 270 | 86.37 | 46 | 13.73 | 241 | 49.65 |
| 15 | 8.14 | 279 | 85.19 | 47 | 13.96 | 257 | 48.6 |
| 16 | 8.28 | 271 | 83.97 | 48 | 14.2 | 265 | 47.48 |
| 17 | 8.42 | 291 | 82.79 | 49 | 14.44 | 268 | 46.32 |
| 18 | 8.56 | 272 | 81.52 | 50 | 14.68 | 234 | 45.15 |
| 19 | 8.71 | 278 | 80.33 | 51 | 14.93 | 212 | 44.13 |
| 20 | 8.86 | 263 | 79.12 | 52 | 15.19 | 246 | 43.21 |
| 21 | 9.01 | 283 | 77.97 | 53 | 15.45 | 210 | 42.13 |
| 22 | 9.16 | 289 | 76.74 | 54 | 15.71 | 261 | 41.22 |
| 23 | 9.32 | 244 | 75.47 | 55 | 15.98 | 263 | 40.08 |
| 24 | 9.48 | 266 | 74.41 | 56 | 16.25 | 210 | 38.93 |
| 25 | 9.64 | 216 | 73.25 | 57 | 16.52 | 254 | 38.01 |
| 26 | 9.8 | 267 | 72.31 | 58 | 16.81 | 226 | 36.9 |
| 27 | 9.97 | 260 | 71.14 | 59 | 17.09 | 228 | 35.92 |
| 28 | 10.14 | 232 | 70.01 | 60 | 17.38 | 215 | 34.92 |
| 29 | 10.31 | 258 | 68.99 | 61 | 17.68 | 235 | 33.98 |
| 30 | 10.48 | 270 | 67.87 | 62 | 17.98 | 221 | 32.96 |
| 31 | 10.66 | 257 | 66.69 | 63 | 18.28 | 232 | 31.99 |
| 32 | 10.84 | 271 | 65.57 | 64 | 18.6 | 217 | 30.98 |
| 33 | 11.03 | 285 | 64.38 | 65 | 18.91 | 226 | 30.03 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 19.23 | 240 | 29.05 | 98 | 32.98 | 105 | 4.52 |
| 67 | 19.56 | 215 | 28 | 99 | 33.55 | 89 | 4.06 |
| 68 | 19.89 | 205 | 27.06 | 100 | 34.12 | 85 | 3.68 |
| 69 | 20.23 | 205 | 26.17 | 101 | 34.7 | 87 | 3.3 |
| 70 | 20.57 | 202 | 25.27 | 102 | 35.29 | 83 | 2.92 |
| 71 | 20.92 | 208 | 24.39 | 103 | 35.89 | 77 | 2.56 |
| 72 | 21.28 | 224 | 23.48 | 104 | 36.5 | 66 | 2.23 |
| 73 | 21.64 | 194 | 22.5 | 105 | 37.12 | 52 | 1.94 |
| 74 | 22.01 | 188 | 21.66 | 106 | 37.75 | 74 | 1.71 |
| 75 | 22.38 | 206 | 20.84 | 107 | 38.39 | 46 | 1.39 |
| 76 | 22.77 | 221 | 19.94 | 108 | 39.04 | 34 | 1.19 |
| 77 | 23.15 | 198 | 18.97 | 109 | 39.71 | 37 | 1.04 |
| 78 | 23.55 | 207 | 18.11 | 110 | 40.38 | 24 | 0.88 |
| 79 | 23.95 | 196 | 17.21 | 111 | 41.07 | 22 | 0.77 |
| 80 | 24.35 | 188 | 16.35 | 112 | 41.76 | 22 | 0.68 |
| 81 | 24.77 | 176 | 15.53 | 113 | 42.47 | 26 | 0.58 |
| 82 | 25.19 | 187 | 14.76 | 114 | 43.2 | 19 | 0.47 |
| 83 | 25.62 | 165 | 13.95 | 115 | 43.93 | 20 | 0.38 |
| 84 | 26.05 | 165 | 13.23 | 116 | 44.68 | 13 | 0.3 |
| 85 | 26.49 | 175 | 12.5 | 117 | 45.44 | 9 | 0.24 |
| 86 | 26.94 | 185 | 11.74 | 118 | 46.21 | 8 | 0.2 |
| 87 | 27.4 | 170 | 10.93 | 119 | 47 | 8 | 0.17 |
| 88 | 27.87 | 171 | 10.19 | 120 | 47.79 | 8 | 0.13 |
| 89 | 28.34 | 133 | 9.45 | 121 | 48.61 | 6 | 0.1 |
| 90 | 28.82 | 135 | 8.86 | 122 | 49.43 | 5 | 0.07 |
| 91 | 29.31 | 165 | 8.28 | 123 | 50.27 | 7 | 0.05 |
| 92 | 29.81 | 119 | 7.56 | 124 | 51.13 | 1 | 0.02 |
| 93 | 30.32 | 128 | 7.04 | 125 | 52 | 2 | 0.01 |
| 94 | 30.83 | 126 | 6.48 | 126 | 52.88 | 0 | 0 |
| 95 | 31.36 | 136 | 5.93 | 127 | 53.78 | 1 | 0 |
| 96 | 31.89 | 102 | 5.33 | | | | |
| 97 | 32.43 | 84 | 4.89 | | | | |

| LAS PROCESS: 10 min to 700 psi, 10 min to 800 psi MS/36.dat | | | | | | |
|---|-------|--------|---------|------|-------|--------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts |
| 2 | 6.54 | 14 | 100 | 33 | 11.03 | 243 |
| 3 | 6.65 | 80 | 99.93 | 34 | 11.21 | 247 |
| 4 | 6.76 | 219 | 99.53 | 35 | 11.4 | 242 |
| 5 | 6.88 | 133 | 98.42 | 36 | 11.6 | 257 |
| 6 | 7 | 137 | 97.75 | 37 | 11.8 | 258 |
| 7 | 7.11 | 145 | 97.06 | 38 | 12 | 284 |
| 8 | 7.24 | 146 | 96.32 | 39 | 12.2 | 309 |
| 9 | 7.36 | 126 | 95.59 | 40 | 12.41 | 290 |
| 10 | 7.48 | 159 | 94.95 | 41 | 12.62 | 278 |
| 11 | 7.61 | 166 | 94.15 | 42 | 12.83 | 266 |
| 12 | 7.74 | 162 | 93.31 | 43 | 13.05 | 303 |
| 13 | 7.87 | 191 | 92.49 | 44 | 13.27 | 258 |
| 14 | 8.01 | 184 | 91.53 | 45 | 13.5 | 283 |
| 15 | 8.14 | 204 | 90.6 | 46 | 13.73 | 290 |
| 16 | 8.28 | 208 | 89.57 | 47 | 13.96 | 281 |
| 17 | 8.42 | 185 | 88.52 | 48 | 14.2 | 275 |
| 18 | 8.56 | 223 | 87.59 | 49 | 14.44 | 239 |
| 19 | 8.71 | 223 | 86.46 | 50 | 14.68 | 260 |
| 20 | 8.86 | 212 | 85.33 | 51 | 14.93 | 275 |
| 21 | 9.01 | 220 | 84.26 | 52 | 15.19 | 277 |
| 22 | 9.16 | 248 | 83.15 | 53 | 15.45 | 256 |
| 23 | 9.32 | 218 | 81.9 | 54 | 15.71 | 244 |
| 24 | 9.48 | 215 | 80.8 | 55 | 15.98 | 248 |
| 25 | 9.64 | 245 | 79.72 | 56 | 16.25 | 246 |
| 26 | 9.8 | 246 | 78.48 | 57 | 16.52 | 232 |
| 27 | 9.97 | 257 | 77.24 | 58 | 16.81 | 261 |
| 28 | 10.14 | 230 | 75.94 | 59 | 17.09 | 247 |
| 29 | 10.31 | 243 | 74.78 | 60 | 17.38 | 254 |
| 30 | 10.48 | 280 | 73.55 | 61 | 17.68 | 267 |
| 31 | 10.66 | 224 | 72.14 | 62 | 17.98 | 207 |
| 32 | 10.84 | 274 | 71.01 | 63 | 18.28 | 245 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts |
| 64 | 18.6 | 244 | 28.62 | 95 | 31.36 | 82 |
| 65 | 18.91 | 239 | 27.39 | 96 | 31.89 | 78 |
| 66 | 19.23 | 236 | 26.19 | 97 | 32.43 | 79 |
| 67 | 19.56 | 192 | 24.99 | 98 | 32.98 | 71 |
| 68 | 19.89 | 200 | 24.02 | 99 | 33.55 | 69 |
| 69 | 20.23 | 192 | 23.01 | 100 | 34.12 | 77 |
| 70 | 20.57 | 147 | 22.05 | 101 | 34.7 | 76 |
| 71 | 20.92 | 183 | 21.3 | 102 | 35.29 | 60 |
| 72 | 21.28 | 169 | 20.38 | 103 | 35.89 | 60 |
| 73 | 21.64 | 156 | 19.53 | 104 | 36.5 | 53 |
| 74 | 22.01 | 174 | 18.74 | 105 | 37.12 | 69 |
| 75 | 22.38 | 175 | 17.86 | 106 | 37.75 | 48 |
| 76 | 22.77 | 137 | 16.98 | 107 | 38.39 | 55 |
| 77 | 23.15 | 136 | 16.29 | 108 | 39.04 | 54 |
| 78 | 23.55 | 140 | 15.6 | 109 | 39.71 | 52 |
| 79 | 23.95 | 139 | 14.89 | 110 | 40.38 | 40 |
| 80 | 24.35 | 149 | 14.19 | 111 | 41.07 | 31 |
| 81 | 24.77 | 115 | 13.44 | 112 | 41.76 | 24 |
| 82 | 25.19 | 124 | 12.86 | 113 | 42.47 | 19 |
| 83 | 25.62 | 121 | 12.23 | 114 | 43.2 | 18 |
| 84 | 26.05 | 104 | 11.62 | 115 | 43.93 | 15 |
| 85 | 26.49 | 118 | 11.1 | 116 | 44.68 | 11 |
| 86 | 26.94 | 112 | 10.5 | 117 | 45.44 | 7 |
| 87 | 27.4 | 109 | 9.93 | 118 | 46.21 | 6 |
| 88 | 27.87 | 114 | 9.38 | 119 | 47 | 4 |
| 89 | 28.34 | 117 | 8.81 | 120 | 47.79 | 4 |
| 90 | 28.82 | 86 | 8.22 | 121 | 48.61 | 2 |
| 91 | 29.31 | 88 | 7.78 | 122 | 49.43 | 0 |
| 92 | 29.81 | 73 | 7.34 | 123 | 50.27 | 1 |
| 93 | 30.32 | 102 | 6.97 | 124 | 51.13 | 2 |
| 94 | 30.83 | 111 | 6.46 | 125 | 52 | 1 |

LAS PROCESS: 30 min to 700 psi, 10 min to 800 psi MS#37.dat

| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
|------|-------|--------|---------|------|-------|--------|---------|
| 2 | 6.54 | 90 | 100 | 34 | 11.21 | 757 | 55.32 |
| 3 | 6.65 | 580 | 99.83 | 35 | 11.4 | 734 | 53.93 |
| 4 | 6.76 | 866 | 98.77 | 36 | 11.6 | 679 | 52.58 |
| 5 | 6.88 | 745 | 97.17 | 37 | 11.8 | 699 | 51.33 |
| 6 | 7 | 845 | 95.8 | 38 | 12 | 672 | 50.04 |
| 7 | 7.11 | 762 | 94.25 | 39 | 12.2 | 653 | 48.81 |
| 8 | 7.24 | 831 | 92.85 | 40 | 12.41 | 623 | 47.61 |
| 9 | 7.36 | 769 | 91.32 | 41 | 12.62 | 643 | 46.46 |
| 10 | 7.48 | 732 | 89.9 | 42 | 12.83 | 668 | 45.28 |
| 11 | 7.61 | 798 | 88.56 | 43 | 13.05 | 644 | 44.05 |
| 12 | 7.74 | 770 | 87.09 | 44 | 13.27 | 572 | 42.86 |
| 13 | 7.87 | 803 | 85.67 | 45 | 13.5 | 630 | 41.81 |
| 14 | 8.01 | 791 | 84.19 | 46 | 13.73 | 586 | 40.65 |
| 15 | 8.14 | 815 | 82.74 | 47 | 13.96 | 601 | 39.57 |
| 16 | 8.28 | 846 | 81.24 | 48 | 14.2 | 625 | 38.47 |
| 17 | 8.42 | 830 | 79.68 | 49 | 14.44 | 576 | 37.32 |
| 18 | 8.56 | 834 | 78.16 | 50 | 14.68 | 554 | 36.26 |
| 19 | 8.71 | 766 | 76.62 | 51 | 14.93 | 542 | 35.24 |
| 20 | 8.86 | 821 | 75.21 | 52 | 15.19 | 600 | 34.24 |
| 21 | 9.01 | 765 | 73.7 | 53 | 15.45 | 565 | 33.14 |
| 22 | 9.16 | 761 | 72.3 | 54 | 15.71 | 524 | 32.1 |
| 23 | 9.32 | 834 | 70.9 | 55 | 15.98 | 572 | 31.14 |
| 24 | 9.48 | 812 | 69.36 | 56 | 16.25 | 525 | 30.08 |
| 25 | 9.64 | 773 | 67.87 | 57 | 16.52 | 511 | 29.12 |
| 26 | 9.8 | 771 | 66.45 | 58 | 16.81 | 553 | 28.18 |
| 27 | 9.97 | 747 | 65.03 | 59 | 17.09 | 472 | 27.16 |
| 28 | 10.14 | 769 | 63.65 | 60 | 17.38 | 487 | 26.29 |
| 29 | 10.31 | 812 | 62.24 | 61 | 17.68 | 492 | 25.4 |
| 30 | 10.48 | 801 | 60.74 | 62 | 17.98 | 444 | 24.49 |
| 31 | 10.66 | 730 | 59.27 | 63 | 18.28 | 457 | 23.67 |
| 32 | 10.84 | 685 | 57.93 | 64 | 18.6 | 448 | 22.83 |
| 33 | 11.03 | 731 | 56.67 | 65 | 18.91 | 466 | 22.01 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 19.23 | 446 | 21.15 | 98 | 32.98 | 155 | 3.33 |
| 67 | 19.56 | 413 | 20.33 | 99 | 33.55 | 186 | 3.04 |
| 68 | 19.89 | 403 | 19.57 | 100 | 34.12 | 131 | 2.7 |
| 69 | 20.23 | 387 | 18.83 | 101 | 34.7 | 146 | 2.46 |
| 70 | 20.57 | 377 | 18.12 | 102 | 35.29 | 126 | 2.19 |
| 71 | 20.92 | 424 | 17.42 | 103 | 35.89 | 101 | 1.96 |
| 72 | 21.28 | 410 | 16.64 | 104 | 36.5 | 110 | 1.77 |
| 73 | 21.64 | 356 | 15.89 | 105 | 37.12 | 105 | 1.57 |
| 74 | 22.01 | 400 | 15.23 | 106 | 37.75 | 81 | 1.38 |
| 75 | 22.38 | 333 | 14.5 | 107 | 38.39 | 64 | 1.23 |
| 76 | 22.77 | 348 | 13.89 | 108 | 39.04 | 65 | 1.11 |
| 77 | 23.15 | 346 | 13.25 | 109 | 39.71 | 58 | 0.99 |
| 78 | 23.55 | 324 | 12.61 | 110 | 40.38 | 59 | 0.88 |
| 79 | 23.95 | 306 | 12.01 | 111 | 41.07 | 57 | 0.77 |
| 80 | 24.35 | 322 | 11.45 | 112 | 41.76 | 39 | 0.67 |
| 81 | 24.77 | 316 | 10.86 | 113 | 42.47 | 49 | 0.6 |
| 82 | 25.19 | 287 | 10.28 | 114 | 43.2 | 43 | 0.51 |
| 83 | 25.62 | 294 | 9.75 | 115 | 43.93 | 34 | 0.43 |
| 84 | 26.05 | 282 | 9.21 | 116 | 44.68 | 36 | 0.37 |
| 85 | 26.49 | 283 | 8.69 | 117 | 45.44 | 25 | 0.3 |
| 86 | 26.94 | 262 | 8.17 | 118 | 46.21 | 23 | 0.25 |
| 87 | 27.4 | 270 | 7.69 | 119 | 47 | 24 | 0.21 |
| 88 | 27.87 | 261 | 7.19 | 120 | 47.79 | 13 | 0.17 |
| 89 | 28.34 | 219 | 6.71 | 121 | 48.61 | 16 | 0.14 |
| 90 | 28.82 | 197 | 6.31 | 122 | 49.43 | 7 | 0.11 |
| 91 | 29.31 | 243 | 5.94 | 123 | 50.27 | 18 | 0.1 |
| 92 | 29.81 | 212 | 5.5 | 124 | 51.13 | 13 | 0.07 |
| 93 | 30.32 | 224 | 5.11 | 125 | 52 | 10 | 0.04 |
| 94 | 30.83 | 194 | 4.69 | 126 | 52.88 | 10 | 0.03 |
| 95 | 31.36 | 189 | 4.34 | 127 | 53.78 | 3 | 0.01 |
| 96 | 31.89 | 176 | 3.99 | 128 | 54.69 | 1 | 0 |
| 97 | 32.43 | 185 | 3.67 | | | | |

LAS PROCESS: 5 min to 800 ps MS#38.dat

| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
|------|-------|--------|---------|------|-------|--------|---------|
| 2 | 6.54 | 25 | 100 | 34 | 11.21 | 240 | 46.87 |
| 3 | 6.65 | 275 | 99.86 | 35 | 11.4 | 232 | 45.53 |
| 4 | 6.76 | 409 | 98.32 | 36 | 11.6 | 225 | 44.24 |
| 5 | 6.88 | 377 | 96.04 | 37 | 11.8 | 226 | 42.98 |
| 6 | 7 | 340 | 93.93 | 38 | 12 | 222 | 41.72 |
| 7 | 7.11 | 310 | 92.04 | 39 | 12.2 | 208 | 40.48 |
| 8 | 7.24 | 313 | 90.3 | 40 | 12.41 | 231 | 39.32 |
| 9 | 7.36 | 334 | 88.56 | 41 | 12.62 | 183 | 38.03 |
| 10 | 7.48 | 362 | 86.69 | 42 | 12.83 | 191 | 37 |
| 11 | 7.61 | 337 | 84.67 | 43 | 13.05 | 196 | 35.94 |
| 12 | 7.74 | 334 | 82.79 | 44 | 13.27 | 184 | 34.84 |
| 13 | 7.87 | 360 | 80.92 | 45 | 13.5 | 193 | 33.81 |
| 14 | 8.01 | 339 | 78.91 | 46 | 13.73 | 184 | 32.74 |
| 15 | 8.14 | 314 | 77.02 | 47 | 13.96 | 192 | 31.71 |
| 16 | 8.28 | 343 | 75.26 | 48 | 14.2 | 160 | 30.64 |
| 17 | 8.42 | 374 | 73.35 | 49 | 14.44 | 165 | 29.74 |
| 18 | 8.56 | 321 | 71.26 | 50 | 14.68 | 176 | 28.82 |
| 19 | 8.71 | 288 | 69.46 | 51 | 14.93 | 162 | 27.84 |
| 20 | 8.86 | 291 | 67.86 | 52 | 15.19 | 159 | 26.93 |
| 21 | 9.01 | 290 | 66.23 | 53 | 15.45 | 155 | 26.04 |
| 22 | 9.16 | 274 | 64.61 | 54 | 15.71 | 152 | 25.18 |
| 23 | 9.32 | 260 | 63.08 | 55 | 15.98 | 140 | 24.33 |
| 24 | 9.48 | 317 | 61.63 | 56 | 16.25 | 142 | 23.55 |
| 25 | 9.64 | 288 | 59.86 | 57 | 16.52 | 140 | 22.75 |
| 26 | 9.8 | 263 | 58.25 | 58 | 16.81 | 151 | 21.97 |
| 27 | 9.97 | 249 | 56.78 | 59 | 17.09 | 158 | 21.13 |
| 28 | 10.14 | 288 | 55.39 | 60 | 17.38 | 129 | 20.25 |
| 29 | 10.31 | 266 | 53.78 | 61 | 17.68 | 138 | 19.53 |
| 30 | 10.48 | 250 | 52.3 | 62 | 17.98 | 136 | 18.76 |
| 31 | 10.66 | 247 | 50.9 | 63 | 18.28 | 128 | 18 |
| 32 | 10.84 | 241 | 49.52 | 64 | 18.6 | 128 | 17.28 |
| 33 | 11.03 | 233 | 48.17 | 65 | 18.91 | 91 | 16.57 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 19.23 | 105 | 16.06 | 98 | 32.98 | 49 | 1.43 |
| 67 | 19.56 | 120 | 15.47 | 99 | 33.55 | 41 | 1.16 |
| 68 | 19.89 | 122 | 14.8 | 100 | 34.12 | 29 | 0.93 |
| 69 | 20.23 | 117 | 14.12 | 101 | 34.7 | 25 | 0.77 |
| 70 | 20.57 | 114 | 13.47 | 102 | 35.29 | 18 | 0.63 |
| 71 | 20.92 | 88 | 12.83 | 103 | 35.89 | 15 | 0.53 |
| 72 | 21.28 | 105 | 12.34 | 104 | 36.5 | 19 | 0.44 |
| 73 | 21.64 | 115 | 11.75 | 105 | 37.12 | 10 | 0.34 |
| 74 | 22.01 | 111 | 11.11 | 106 | 37.75 | 8 | 0.28 |
| 75 | 22.38 | 100 | 10.49 | 107 | 38.39 | 10 | 0.23 |
| 76 | 22.77 | 95 | 9.93 | 108 | 39.04 | 3 | 0.18 |
| 77 | 23.15 | 97 | 9.4 | 109 | 39.71 | 10 | 0.16 |
| 78 | 23.55 | 98 | 8.86 | 110 | 40.38 | 1 | 0.11 |
| 79 | 23.95 | 101 | 8.31 | 111 | 41.07 | 3 | 0.1 |
| 80 | 24.35 | 72 | 7.75 | 112 | 41.76 | 5 | 0.08 |
| 81 | 24.77 | 86 | 7.34 | 113 | 42.47 | 2 | 0.06 |
| 82 | 25.19 | 80 | 6.86 | 114 | 43.2 | 0 | 0.04 |
| 83 | 25.62 | 86 | 6.42 | 115 | 43.93 | 2 | 0.04 |
| 84 | 26.05 | 82 | 5.94 | 116 | 44.68 | 1 | 0.03 |
| 85 | 26.49 | 71 | 5.48 | 117 | 45.44 | 0 | 0.03 |
| 86 | 26.94 | 70 | 5.08 | 118 | 46.21 | 0 | 0.03 |
| 87 | 27.4 | 85 | 4.69 | 119 | 47 | 1 | 0.03 |
| 88 | 27.87 | 56 | 4.22 | 120 | 47.79 | 2 | 0.02 |
| 89 | 28.34 | 72 | 3.9 | 121 | 48.61 | 1 | 0.01 |
| 90 | 28.82 | 46 | 3.5 | 122 | 49.43 | 0 | 0.01 |
| 91 | 29.31 | 57 | 3.25 | 123 | 50.27 | 0 | 0.01 |
| 92 | 29.81 | 56 | 2.93 | 124 | 51.13 | 0 | 0.01 |
| 93 | 30.32 | 47 | 2.61 | 125 | 52 | 0 | 0.01 |
| 94 | 30.83 | 53 | 2.35 | 126 | 52.88 | 1 | 0.01 |
| 95 | 31.36 | 42 | 2.06 | 97 | 32.43 | 38 | 1.64 |
| 96 | 31.89 | 32 | 1.82 | | | | |

| LAS PROCESS: 5 min to 800 psi MS#38a.dat | | | | | | | |
|--|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 2 | 6.54 | 54 | 100 | 33 | 11.03 | 40 | 28.79 |
| 3 | 6.65 | 108 | 98.24 | 34 | 11.21 | 36 | 27.48 |
| 4 | 6.76 | 101 | 94.72 | 35 | 11.4 | 31 | 26.31 |
| 5 | 6.88 | 91 | 91.44 | 36 | 11.6 | 39 | 25.3 |
| 6 | 7 | 89 | 88.47 | 37 | 11.8 | 33 | 24.03 |
| 7 | 7.11 | 83 | 85.57 | 38 | 12 | 38 | 22.96 |
| 8 | 7.24 | 82 | 82.87 | 39 | 12.2 | 27 | 21.72 |
| 9 | 7.36 | 82 | 80.2 | 40 | 12.41 | 35 | 20.84 |
| 10 | 7.48 | 69 | 77.53 | 41 | 12.62 | 34 | 19.7 |
| 11 | 7.61 | 71 | 75.28 | 42 | 12.83 | 22 | 18.59 |
| 12 | 7.74 | 78 | 72.97 | 43 | 13.05 | 26 | 17.88 |
| 13 | 7.87 | 72 | 70.43 | 44 | 13.27 | 26 | 17.03 |
| 14 | 8.01 | 76 | 68.09 | 45 | 13.5 | 21 | 16.18 |
| 15 | 8.14 | 97 | 65.61 | 46 | 13.73 | 10 | 15.5 |
| 16 | 8.28 | 90 | 62.46 | 47 | 13.96 | 15 | 15.17 |
| 17 | 8.42 | 74 | 59.52 | 48 | 14.2 | 15 | 14.69 |
| 18 | 8.56 | 76 | 57.11 | 49 | 14.44 | 18 | 14.2 |
| 19 | 8.71 | 70 | 54.64 | 50 | 14.68 | 19 | 13.61 |
| 20 | 8.86 | 67 | 52.36 | 51 | 14.93 | 14 | 12.99 |
| 21 | 9.01 | 69 | 50.18 | 52 | 15.19 | 23 | 12.54 |
| 22 | 9.16 | 82 | 47.93 | 53 | 15.45 | 15 | 11.79 |
| 23 | 9.32 | 55 | 45.26 | 54 | 15.71 | 14 | 11.3 |
| 24 | 9.48 | 63 | 43.47 | 55 | 15.98 | 11 | 10.84 |
| 25 | 9.64 | 56 | 41.42 | 56 | 16.25 | 13 | 10.49 |
| 26 | 9.8 | 43 | 39.6 | 57 | 16.52 | 17 | 10.06 |
| 27 | 9.97 | 58 | 38.2 | 58 | 16.81 | 11 | 9.51 |
| 28 | 10.14 | 50 | 36.31 | 59 | 17.09 | 9 | 9.15 |
| 29 | 10.31 | 44 | 34.68 | 60 | 17.38 | 14 | 8.86 |
| 30 | 10.48 | 52 | 33.25 | 61 | 17.68 | 10 | 8.4 |
| 31 | 10.66 | 47 | 31.55 | 62 | 17.98 | 11 | 8.08 |
| 32 | 10.84 | 38 | 30.02 | 63 | 18.28 | 13 | 7.72 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 64 | 18.6 | 7 | 7.29 | 95 | 31.36 | 2 | 1.27 |
| 65 | 18.91 | 10 | 7.07 | 96 | 31.89 | 1 | 1.2 |
| 66 | 19.23 | 13 | 6.74 | 97 | 32.43 | 2 | 1.17 |
| 67 | 19.56 | 10 | 6.32 | 98 | 32.98 | 3 | 1.11 |
| 68 | 19.89 | 13 | 5.99 | 99 | 33.55 | 3 | 1.01 |
| 69 | 20.23 | 5 | 5.57 | 100 | 34.12 | 0 | 0.91 |
| 70 | 20.57 | 11 | 5.41 | 101 | 34.7 | 1 | 0.91 |
| 71 | 20.92 | 5 | 5.05 | 102 | 35.29 | 3 | 0.88 |
| 72 | 21.28 | 6 | 4.88 | 103 | 35.89 | 0 | 0.78 |
| 73 | 21.64 | 8 | 4.69 | 104 | 36.5 | 2 | 0.78 |
| 74 | 22.01 | 4 | 4.43 | 105 | 37.12 | 1 | 0.72 |
| 75 | 22.38 | 3 | 4.3 | 106 | 37.75 | 2 | 0.68 |
| 76 | 22.77 | 7 | 4.2 | 107 | 38.39 | 1 | 0.62 |
| 77 | 23.15 | 4 | 3.97 | 108 | 39.04 | 3 | 0.59 |
| 78 | 23.55 | 9 | 3.84 | 109 | 39.71 | 2 | 0.49 |
| 79 | 23.95 | 4 | 3.55 | 110 | 40.38 | 1 | 0.42 |
| 80 | 24.35 | 5 | 3.42 | 111 | 41.07 | 2 | 0.39 |
| 81 | 24.77 | 6 | 3.26 | 112 | 41.76 | 0 | 0.33 |
| 82 | 25.19 | 2 | 3.06 | 113 | 42.47 | 2 | 0.33 |
| 83 | 25.62 | 5 | 3 | 114 | 43.2 | 1 | 0.26 |
| 84 | 26.05 | 5 | 2.83 | 115 | 43.93 | 1 | 0.23 |
| 85 | 26.49 | 2 | 2.67 | 116 | 44.68 | 1 | 0.2 |
| 86 | 26.94 | 5 | 2.61 | 117 | 45.44 | 1 | 0.16 |
| 87 | 27.4 | 5 | 2.44 | 118 | 46.21 | 1 | 0.13 |
| 88 | 27.87 | 5 | 2.28 | 119 | 47 | 1 | 0.1 |
| 89 | 28.34 | 3 | 2.12 | 120 | 47.79 | 0 | 0.07 |
| 90 | 28.82 | 6 | 2.02 | 121 | 48.61 | 1 | 0.07 |
| 91 | 29.31 | 5 | 1.82 | 122 | 49.43 | 0 | 0.03 |
| 92 | 29.81 | 2 | 1.66 | 123 | 50.27 | 0 | 0.03 |
| 93 | 30.32 | 6 | 1.6 | 124 | 51.13 | 1 | 0.03 |
| 94 | 30.83 | 4 | 1.4 | | | | |

LAS PROCESS: 60 min holding time MS#40.dat

| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
|------|-------|--------|---------|------|-------|--------|---------|
| 2 | 8.26 | 20 | 100 | 34 | 15.37 | 98 | 62.57 |
| 3 | 8.42 | 50 | 99.57 | 35 | 15.67 | 105 | 60.46 |
| 4 | 8.59 | 74 | 98.5 | 36 | 15.98 | 95 | 58.21 |
| 5 | 8.75 | 31 | 96.91 | 37 | 16.29 | 81 | 56.17 |
| 6 | 8.93 | 40 | 96.24 | 38 | 16.61 | 64 | 54.43 |
| 7 | 9.1 | 32 | 95.38 | 39 | 16.94 | 64 | 53.05 |
| 8 | 9.28 | 73 | 94.69 | 40 | 17.27 | 74 | 51.68 |
| 9 | 9.46 | 27 | 93.12 | 41 | 17.61 | 51 | 50.09 |
| 10 | 9.65 | 29 | 92.54 | 42 | 17.95 | 65 | 48.99 |
| 11 | 9.84 | 36 | 91.92 | 43 | 18.3 | 64 | 47.59 |
| 12 | 10.03 | 31 | 91.15 | 44 | 18.66 | 63 | 46.22 |
| 13 | 10.23 | 41 | 90.48 | 45 | 19.03 | 43 | 44.86 |
| 14 | 10.43 | 51 | 89.6 | 46 | 19.4 | 59 | 43.94 |
| 15 | 10.63 | 56 | 88.5 | 47 | 19.78 | 37 | 42.67 |
| 16 | 10.84 | 118 | 87.3 | 48 | 20.17 | 76 | 41.88 |
| 17 | 11.05 | 39 | 84.77 | 49 | 20.56 | 51 | 40.24 |
| 18 | 11.27 | 49 | 83.93 | 50 | 20.97 | 45 | 39.15 |
| 19 | 11.49 | 61 | 82.87 | 51 | 21.38 | 40 | 38.18 |
| 20 | 11.71 | 60 | 81.56 | 52 | 21.8 | 82 | 37.32 |
| 21 | 11.94 | 54 | 80.28 | 53 | 22.22 | 39 | 35.56 |
| 22 | 12.18 | 54 | 79.11 | 54 | 22.66 | 50 | 34.72 |
| 23 | 12.42 | 48 | 77.95 | 55 | 23.1 | 31 | 33.65 |
| 24 | 12.66 | 57 | 76.92 | 56 | 23.56 | 85 | 32.98 |
| 25 | 12.91 | 49 | 75.7 | 57 | 24.02 | 39 | 31.16 |
| 26 | 13.16 | 50 | 74.65 | 58 | 24.49 | 33 | 30.32 |
| 27 | 13.42 | 58 | 73.57 | 59 | 24.97 | 30 | 29.61 |
| 28 | 13.68 | 65 | 72.32 | 60 | 25.46 | 55 | 28.96 |
| 29 | 13.95 | 64 | 70.93 | 61 | 25.96 | 31 | 27.78 |
| 30 | 14.22 | 73 | 69.55 | 62 | 26.47 | 31 | 27.12 |
| 31 | 14.5 | 67 | 67.98 | 63 | 26.99 | 36 | 26.45 |
| 32 | 14.78 | 86 | 66.54 | 64 | 27.51 | 68 | 25.68 |
| 33 | 15.07 | 99 | 64.7 | 65 | 28.05 | 32 | 24.22 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 28.6 | 24 | 23.53 | 98 | 53.24 | 15 | 4.66 |
| 67 | 29.16 | 31 | 23.01 | 99 | 54.28 | 13 | 4.34 |
| 68 | 29.74 | 36 | 22.35 | 100 | 55.34 | 8 | 4.06 |
| 69 | 30.32 | 43 | 21.57 | 101 | 56.43 | 15 | 3.89 |
| 70 | 30.91 | 26 | 20.65 | 102 | 57.53 | 12 | 3.57 |
| 71 | 31.52 | 35 | 20.09 | 103 | 58.66 | 13 | 3.31 |
| 72 | 32.14 | 40 | 19.34 | 104 | 59.81 | 16 | 3.03 |
| 73 | 32.77 | 32 | 18.48 | 105 | 60.98 | 10 | 2.69 |
| 74 | 33.41 | 35 | 17.79 | 106 | 62.18 | 10 | 2.47 |
| 75 | 34.06 | 37 | 17.04 | 107 | 63.4 | 13 | 2.26 |
| 76 | 34.73 | 38 | 16.24 | 108 | 64.64 | 14 | 1.98 |
| 77 | 35.41 | 31 | 15.43 | 109 | 65.91 | 8 | 1.68 |
| 78 | 36.11 | 40 | 14.76 | 110 | 67.2 | 7 | 1.5 |
| 79 | 36.82 | 30 | 13.9 | 111 | 68.52 | 3 | 1.35 |
| 80 | 37.54 | 28 | 13.26 | 112 | 69.86 | 3 | 1.29 |
| 81 | 38.27 | 29 | 12.66 | 113 | 71.23 | 3 | 1.22 |
| 82 | 39.02 | 25 | 12.03 | 114 | 72.62 | 4 | 1.16 |
| 83 | 39.79 | 32 | 11.5 | 115 | 74.05 | 4 | 1.07 |
| 84 | 40.57 | 18 | 10.81 | 116 | 75.5 | 2 | 0.99 |
| 85 | 41.36 | 22 | 10.42 | 117 | 76.98 | 7 | 0.95 |
| 86 | 42.17 | 14 | 9.95 | 118 | 78.49 | 8 | 0.8 |
| 87 | 43 | 19 | 9.65 | 119 | 80.03 | 2 | 0.62 |
| 88 | 43.84 | 33 | 9.24 | 120 | 81.59 | 6 | 0.58 |
| 89 | 44.7 | 24 | 8.53 | 121 | 83.19 | 2 | 0.45 |
| 90 | 45.58 | 23 | 8.01 | 122 | 84.82 | 4 | 0.41 |
| 91 | 46.47 | 28 | 7.52 | 123 | 86.49 | 4 | 0.32 |
| 92 | 47.38 | 18 | 6.92 | 124 | 88.18 | 1 | 0.24 |
| 93 | 48.31 | 15 | 6.53 | 125 | 89.91 | 2 | 0.21 |
| 94 | 49.26 | 22 | 6.21 | 126 | 91.67 | 1 | 0.17 |
| 95 | 50.22 | 18 | 5.74 | 127 | 93.47 | 1 | 0.15 |
| 96 | 51.21 | 16 | 5.35 | 128 | 95.3 | 6 | 0.13 |

97 52.21 16 5.01

| LAS PROCESS: 60 min holding time MS#40a.dat | | | | | | | |
|---|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 2 | 8.26 | 61 | 100 | 34 | 15.37 | 102 | 47.56 |
| 3 | 8.42 | 86 | 98.91 | 35 | 15.67 | 93 | 45.74 |
| 4 | 8.59 | 109 | 97.38 | 36 | 15.98 | 89 | 44.08 |
| 5 | 8.75 | 65 | 95.43 | 37 | 16.29 | 61 | 42.5 |
| 6 | 8.93 | 75 | 94.27 | 38 | 16.61 | 69 | 41.41 |
| 7 | 9.1 | 60 | 92.93 | 39 | 16.94 | 48 | 40.17 |
| 8 | 9.28 | 106 | 91.86 | 40 | 17.27 | 53 | 39.32 |
| 9 | 9.46 | 43 | 89.97 | 41 | 17.61 | 39 | 38.37 |
| 10 | 9.65 | 71 | 89.2 | 42 | 17.95 | 56 | 37.68 |
| 11 | 9.84 | 90 | 87.94 | 43 | 18.3 | 34 | 36.68 |
| 12 | 10.03 | 132 | 86.33 | 44 | 18.66 | 65 | 36.07 |
| 13 | 10.23 | 109 | 83.97 | 45 | 19.03 | 39 | 34.91 |
| 14 | 10.43 | 100 | 82.03 | 46 | 19.4 | 55 | 34.21 |
| 15 | 10.63 | 83 | 80.24 | 47 | 19.78 | 40 | 33.23 |
| 16 | 10.84 | 238 | 78.76 | 48 | 20.17 | 83 | 32.52 |
| 17 | 11.05 | 49 | 74.51 | 49 | 20.56 | 30 | 31.04 |
| 18 | 11.27 | 57 | 73.64 | 50 | 20.97 | 46 | 30.5 |
| 19 | 11.49 | 76 | 72.62 | 51 | 21.38 | 35 | 29.68 |
| 20 | 11.71 | 71 | 71.27 | 52 | 21.8 | 66 | 29.06 |
| 21 | 11.94 | 78 | 70 | 53 | 22.22 | 23 | 27.88 |
| 22 | 12.18 | 58 | 68.61 | 54 | 22.66 | 39 | 27.47 |
| 23 | 12.42 | 63 | 67.57 | 55 | 23.1 | 30 | 26.77 |
| 24 | 12.66 | 68 | 66.45 | 56 | 23.56 | 107 | 26.24 |
| 25 | 12.91 | 59 | 65.23 | 57 | 24.02 | 18 | 24.33 |
| 26 | 13.16 | 59 | 64.18 | 58 | 24.49 | 27 | 24 |
| 27 | 13.42 | 68 | 63.13 | 59 | 24.97 | 23 | 23.52 |
| 28 | 13.68 | 91 | 61.91 | 60 | 25.46 | 42 | 23.11 |
| 29 | 13.95 | 97 | 60.29 | 61 | 25.96 | 14 | 22.36 |
| 30 | 14.22 | 111 | 58.56 | 62 | 26.47 | 28 | 22.11 |
| 31 | 14.5 | 170 | 56.58 | 63 | 26.99 | 26 | 21.61 |
| 32 | 14.78 | 169 | 53.54 | 64 | 27.51 | 56 | 21.15 |
| 33 | 15.07 | 166 | 50.53 | 65 | 28.05 | 24 | 20.15 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 28.6 | 27 | 19.72 | 98 | 53.24 | 25 | 5.85 |
| 67 | 29.16 | 21 | 19.24 | 99 | 54.28 | 12 | 5.41 |
| 68 | 29.74 | 26 | 18.86 | 100 | 55.34 | 14 | 5.19 |
| 69 | 30.32 | 22 | 18.4 | 101 | 56.43 | 18 | 4.94 |
| 70 | 30.91 | 26 | 18.01 | 102 | 57.53 | 20 | 4.62 |
| 71 | 31.52 | 20 | 17.54 | 103 | 58.66 | 17 | 4.27 |
| 72 | 32.14 | 28 | 17.19 | 104 | 59.81 | 14 | 3.96 |
| 73 | 32.77 | 34 | 16.69 | 105 | 60.98 | 13 | 3.71 |
| 74 | 33.41 | 25 | 16.08 | 106 | 62.18 | 18 | 3.48 |
| 75 | 34.06 | 32 | 15.63 | 107 | 63.4 | 16 | 3.16 |
| 76 | 34.73 | 26 | 15.06 | 108 | 64.64 | 10 | 2.87 |
| 77 | 35.41 | 32 | 14.6 | 109 | 65.91 | 18 | 2.69 |
| 78 | 36.11 | 22 | 14.03 | 110 | 67.2 | 8 | 2.37 |
| 79 | 36.82 | 30 | 13.64 | 111 | 68.52 | 14 | 2.23 |
| 80 | 37.54 | 32 | 13.1 | 112 | 69.86 | 12 | 1.98 |
| 81 | 38.27 | 30 | 12.53 | 113 | 71.23 | 12 | 1.77 |
| 82 | 39.02 | 29 | 11.99 | 114 | 72.62 | 8 | 1.55 |
| 83 | 39.79 | 23 | 11.48 | 115 | 74.05 | 11 | 1.41 |
| 84 | 40.57 | 24 | 11.07 | 116 | 75.5 | 5 | 1.21 |
| 85 | 41.36 | 16 | 10.64 | 117 | 76.98 | 6 | 1.12 |
| 86 | 42.17 | 19 | 10.35 | 118 | 78.49 | 6 | 1.02 |
| 87 | 43 | 27 | 10.01 | 119 | 80.03 | 6 | 0.91 |
| 88 | 43.84 | 14 | 9.53 | 120 | 81.59 | 7 | 0.8 |
| 89 | 44.7 | 24 | 9.28 | 121 | 83.19 | 5 | 0.68 |
| 90 | 45.58 | 22 | 8.85 | 122 | 84.82 | 8 | 0.59 |
| 91 | 46.47 | 24 | 8.46 | 123 | 86.49 | 4 | 0.45 |
| 92 | 47.38 | 25 | 8.03 | 124 | 88.18 | 4 | 0.37 |
| 93 | 48.31 | 15 | 7.59 | 125 | 89.91 | 3 | 0.3 |
| 94 | 49.26 | 29 | 7.32 | 126 | 91.67 | 2 | 0.25 |

| | | | | | | | |
|----|-------|----|------|-----|-------|----|------|
| 95 | 50.22 | 18 | 6.8 | 127 | 93.47 | 2 | 0.21 |
| 96 | 51.21 | 16 | 6.48 | 128 | 95.3 | 10 | 0.18 |
| 97 | 52.21 | 19 | 6.19 | | | | |

| LAS PROCESS: 30 min holding time MS#41.dat | | | | | | | |
|--|-------|-------|---------|------|-------|-------|---------|
| Chnl | Size | count | %larger | Chnl | Size | Count | %larger |
| 2 | 8.26 | 8 | 100 | 33 | 15.07 | 50 | 59.83 |
| 3 | 8.42 | 27 | 99.69 | 34 | 15.37 | 62 | 57.89 |
| 4 | 8.59 | 25 | 98.64 | 35 | 15.67 | 57 | 55.48 |
| 5 | 8.75 | 20 | 97.67 | 36 | 15.98 | 58 | 53.26 |
| 6 | 8.93 | 38 | 96.89 | 37 | 16.29 | 65 | 51.01 |
| 7 | 9.1 | 34 | 95.42 | 38 | 16.61 | 67 | 48.48 |
| 8 | 9.28 | 69 | 94.09 | 39 | 16.94 | 51 | 45.88 |
| 9 | 9.46 | 33 | 91.41 | 40 | 17.27 | 40 | 43.9 |
| 10 | 9.65 | 23 | 90.13 | 41 | 17.61 | 44 | 42.35 |
| 11 | 9.84 | 26 | 89.24 | 42 | 17.95 | 34 | 40.64 |
| 12 | 10.03 | 26 | 88.23 | 43 | 18.3 | 31 | 39.32 |
| 13 | 10.23 | 32 | 87.22 | 44 | 18.66 | 43 | 38.11 |
| 14 | 10.43 | 25 | 85.98 | 45 | 19.03 | 31 | 36.44 |
| 15 | 10.63 | 24 | 85 | 46 | 19.4 | 35 | 35.24 |
| 16 | 10.84 | 82 | 84.07 | 47 | 19.78 | 28 | 33.88 |
| 17 | 11.05 | 22 | 80.89 | 48 | 20.17 | 47 | 32.79 |
| 18 | 11.27 | 27 | 80.03 | 49 | 20.56 | 32 | 30.96 |
| 19 | 11.49 | 33 | 78.98 | 50 | 20.97 | 35 | 29.72 |
| 20 | 11.71 | 30 | 77.7 | 51 | 21.38 | 20 | 28.36 |
| 21 | 11.94 | 34 | 76.53 | 52 | 21.8 | 35 | 27.58 |
| 22 | 12.18 | 28 | 75.21 | 53 | 22.22 | 13 | 26.22 |
| 23 | 12.42 | 28 | 74.13 | 54 | 22.66 | 14 | 25.72 |
| 24 | 12.66 | 31 | 73.04 | 55 | 23.1 | 21 | 25.17 |
| 25 | 12.91 | 27 | 71.83 | 56 | 23.56 | 53 | 24.36 |
| 26 | 13.16 | 43 | 70.78 | 57 | 24.02 | 19 | 22.3 |
| 27 | 13.42 | 31 | 69.11 | 58 | 24.49 | 21 | 21.56 |
| 28 | 13.68 | 33 | 67.91 | 59 | 24.97 | 17 | 20.75 |
| 29 | 13.95 | 48 | 66.63 | 60 | 25.46 | 28 | 20.09 |
| 30 | 14.22 | 32 | 64.76 | 61 | 25.96 | 14 | 19 |
| 31 | 14.5 | 43 | 63.52 | 62 | 26.47 | 15 | 18.45 |
| 32 | 14.78 | 52 | 61.85 | 63 | 26.99 | 12 | 17.87 |
| Chnl | Size | Count | %larger | Chnl | Size | Count | %larger |
| 64 | 27.51 | 46 | 17.4 | 95 | 50.22 | 4 | 2.02 |
| 65 | 28.05 | 17 | 15.62 | 96 | 51.21 | 3 | 1.86 |
| 66 | 28.6 | 9 | 14.96 | 97 | 52.21 | 6 | 1.75 |
| 67 | 29.16 | 12 | 14.61 | 98 | 53.24 | 8 | 1.52 |
| 68 | 29.74 | 10 | 14.14 | 99 | 54.28 | 3 | 1.2 |
| 69 | 30.32 | 11 | 13.75 | 100 | 55.34 | 5 | 1.09 |
| 70 | 30.91 | 13 | 13.33 | 101 | 56.43 | 7 | 0.89 |
| 71 | 31.52 | 11 | 12.82 | 102 | 57.53 | 0 | 0.62 |
| 72 | 32.14 | 13 | 12.39 | 103 | 58.66 | 3 | 0.62 |
| 73 | 32.77 | 16 | 11.89 | 104 | 59.81 | 0 | 0.51 |
| 74 | 33.41 | 15 | 11.27 | 105 | 60.98 | 2 | 0.51 |
| 75 | 34.06 | 17 | 10.68 | 106 | 62.18 | 1 | 0.43 |
| 76 | 34.73 | 15 | 10.02 | 107 | 63.4 | 0 | 0.39 |
| 77 | 35.41 | 17 | 9.44 | 108 | 64.64 | 2 | 0.39 |
| 78 | 36.11 | 12 | 8.78 | 109 | 65.91 | 1 | 0.31 |
| 79 | 36.82 | 14 | 8.31 | 110 | 67.2 | 0 | 0.27 |
| 80 | 37.54 | 16 | 7.77 | 111 | 68.52 | 3 | 0.27 |
| 81 | 38.27 | 16 | 7.15 | 112 | 69.86 | 1 | 0.16 |
| 82 | 39.02 | 15 | 6.53 | 113 | 71.23 | 1 | 0.12 |
| 83 | 39.79 | 15 | 5.94 | 114 | 72.62 | 0 | 0.08 |
| 84 | 40.57 | 12 | 5.36 | 115 | 74.05 | 0 | 0.08 |
| 85 | 41.36 | 12 | 4.9 | 116 | 75.5 | 0 | 0.08 |
| 86 | 42.17 | 7 | 4.43 | 117 | 76.98 | 0 | 0.08 |
| 87 | 43 | 6 | 4.16 | 118 | 78.49 | 1 | 0.08 |
| 88 | 43.84 | 13 | 3.92 | 119 | 80.03 | 0 | 0.04 |
| 89 | 44.7 | 10 | 3.42 | 120 | 81.59 | 0 | 0.04 |
| 90 | 45.58 | 8 | 3.03 | 121 | 83.19 | 0 | 0.04 |

| | | | | | | | |
|----|-------|---|------|-----|-------|---|------|
| 91 | 46.47 | 5 | 2.72 | 122 | 84.82 | 0 | 0.04 |
| 92 | 47.38 | 3 | 2.53 | 123 | 86.49 | 0 | 0.04 |
| 93 | 48.31 | 5 | 2.41 | 124 | 88.18 | 1 | 0.04 |
| 94 | 49.26 | 5 | 2.21 | | | | |

LAS PROCESS: 30 min holding time MS#41a.dat

| Chnl | Size | Count | %larger | Chnl | Size | Count | %larger |
|------|-------|-------|---------|------|-------|-------|---------|
| 2 | 8.26 | 141 | 100 | 34 | 15.37 | 1065 | 62.64 |
| 3 | 8.42 | 233 | 99.7 | 35 | 15.67 | 1057 | 60.4 |
| 4 | 8.59 | 370 | 99.21 | 36 | 15.98 | 1014 | 58.18 |
| 5 | 8.75 | 251 | 98.44 | 37 | 16.29 | 797 | 56.05 |
| 6 | 8.93 | 310 | 97.91 | 38 | 16.61 | 872 | 54.37 |
| 7 | 9.1 | 348 | 97.26 | 39 | 16.94 | 700 | 52.54 |
| 8 | 9.28 | 656 | 96.53 | 40 | 17.27 | 884 | 51.07 |
| 9 | 9.46 | 246 | 95.15 | 41 | 17.61 | 720 | 49.21 |
| 10 | 9.65 | 290 | 94.63 | 42 | 17.95 | 864 | 47.7 |
| 11 | 9.84 | 327 | 94.02 | 43 | 18.3 | 614 | 45.89 |
| 12 | 10.03 | 378 | 93.34 | 44 | 18.66 | 910 | 44.6 |
| 13 | 10.23 | 416 | 92.54 | 45 | 19.03 | 601 | 42.68 |
| 14 | 10.43 | 492 | 91.67 | 46 | 19.4 | 851 | 41.42 |
| 15 | 10.63 | 550 | 90.63 | 47 | 19.78 | 558 | 39.63 |
| 16 | 10.84 | 1313 | 89.48 | 48 | 20.17 | 1008 | 38.46 |
| 17 | 11.05 | 393 | 86.72 | 49 | 20.56 | 530 | 36.34 |
| 18 | 11.27 | 431 | 85.89 | 50 | 20.97 | 717 | 35.23 |
| 19 | 11.49 | 471 | 84.99 | 51 | 21.38 | 497 | 33.72 |
| 20 | 11.71 | 496 | 84 | 52 | 21.8 | 970 | 32.68 |
| 21 | 11.94 | 565 | 82.96 | 53 | 22.22 | 480 | 30.64 |
| 22 | 12.18 | 610 | 81.77 | 54 | 22.66 | 575 | 29.63 |
| 23 | 12.42 | 645 | 80.49 | 55 | 23.1 | 424 | 28.43 |
| 24 | 12.66 | 666 | 79.13 | 56 | 23.56 | 1062 | 27.54 |
| 25 | 12.91 | 668 | 77.74 | 57 | 24.02 | 395 | 25.3 |
| 26 | 13.16 | 673 | 76.33 | 58 | 24.49 | 428 | 24.47 |
| 27 | 13.42 | 695 | 74.92 | 59 | 24.97 | 397 | 23.58 |
| 28 | 13.68 | 669 | 73.46 | 60 | 25.46 | 578 | 22.74 |
| 29 | 13.95 | 710 | 72.05 | 61 | 25.96 | 362 | 21.53 |
| 30 | 14.22 | 749 | 70.56 | 62 | 26.47 | 414 | 20.77 |
| 31 | 14.5 | 895 | 68.99 | 63 | 26.99 | 354 | 19.9 |
| 32 | 14.78 | 1074 | 67.11 | 64 | 27.51 | 824 | 19.15 |
| 33 | 15.07 | 1054 | 64.85 | 65 | 28.05 | 287 | 17.42 |
| Chnl | Size | Count | %larger | Chnl | Size | Count | %larger |
| 66 | 28.6 | 296 | 16.82 | 98 | 53.24 | 66 | 1.24 |
| 67 | 29.16 | 293 | 16.2 | 99 | 54.28 | 67 | 1.11 |
| 68 | 29.74 | 319 | 15.58 | 100 | 55.34 | 56 | 0.96 |
| 69 | 30.32 | 361 | 14.91 | 101 | 56.43 | 44 | 0.85 |
| 70 | 30.91 | 349 | 14.15 | 102 | 57.53 | 46 | 0.75 |
| 71 | 31.52 | 406 | 13.42 | 103 | 58.66 | 39 | 0.66 |
| 72 | 32.14 | 357 | 12.57 | 104 | 59.81 | 34 | 0.58 |
| 73 | 32.77 | 361 | 11.82 | 105 | 60.98 | 22 | 0.5 |
| 74 | 33.41 | 361 | 11.06 | 106 | 62.18 | 29 | 0.46 |
| 75 | 34.06 | 350 | 10.3 | 107 | 63.4 | 26 | 0.4 |
| 76 | 34.73 | 352 | 9.57 | 108 | 64.64 | 19 | 0.34 |
| 77 | 35.41 | 309 | 8.83 | 109 | 65.91 | 13 | 0.3 |
| 78 | 36.11 | 315 | 8.18 | 110 | 67.2 | 24 | 0.28 |
| 79 | 36.82 | 289 | 7.51 | 111 | 68.52 | 17 | 0.22 |
| 80 | 37.54 | 250 | 6.91 | 112 | 69.86 | 13 | 0.19 |
| 81 | 38.27 | 242 | 6.38 | 113 | 71.23 | 12 | 0.16 |
| 82 | 39.02 | 210 | 5.87 | 114 | 72.62 | 7 | 0.14 |
| 83 | 39.79 | 207 | 5.43 | 115 | 74.05 | 12 | 0.12 |
| 84 | 40.57 | 173 | 5 | 116 | 75.5 | 6 | 0.1 |
| 85 | 41.36 | 205 | 4.63 | 117 | 76.98 | 6 | 0.08 |
| 86 | 42.17 | 170 | 4.2 | 118 | 78.49 | 5 | 0.07 |
| 87 | 43 | 192 | 3.85 | 119 | 80.03 | 8 | 0.06 |
| 88 | 43.84 | 138 | 3.44 | 120 | 81.59 | 5 | 0.04 |
| 89 | 44.7 | 118 | 3.15 | 121 | 83.19 | 1 | 0.03 |
| 90 | 45.58 | 123 | 2.91 | 122 | 84.82 | 2 | 0.03 |
| 91 | 46.47 | 138 | 2.65 | 123 | 86.49 | 3 | 0.03 |

| | | | | | | | |
|----|-------|-----|------|-----|-------|---|------|
| 92 | 47.38 | 92 | 2.36 | 124 | 88.18 | 3 | 0.02 |
| 93 | 48.31 | 110 | 2.16 | 125 | 89.91 | 1 | 0.01 |
| 94 | 49.26 | 79 | 1.93 | 126 | 91.67 | 0 | 0.01 |
| 95 | 50.22 | 86 | 1.77 | 127 | 93.47 | 4 | 0.01 |
| 96 | 51.21 | 86 | 1.59 | 128 | 95.3 | 2 | 0 |
| 97 | 52.21 | 77 | 1.41 | | | | |

GAS PRIME: Acetaminophen/Ethanol MS#50.dat

| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
|------|-------|--------|---------|------|-------|--------|---------|
| 2 | 3.74 | 6 | 100 | 31 | 6.33 | 15 | 15.7 |
| 3 | 3.81 | 12 | 99.4 | 32 | 6.44 | 7 | 14.2 |
| 4 | 3.88 | 20 | 98.2 | 33 | 6.56 | 13 | 13.5 |
| 5 | 3.95 | 14 | 96.2 | 34 | 6.68 | 8 | 12.2 |
| 6 | 4.02 | 20 | 94.8 | 35 | 6.8 | 10 | 11.4 |
| 7 | 4.09 | 24 | 92.8 | 36 | 6.93 | 10 | 10.4 |
| 8 | 4.17 | 17 | 90.4 | 37 | 7.05 | 4 | 9.4 |
| 9 | 4.24 | 24 | 88.7 | 38 | 7.18 | 5 | 9 |
| 10 | 4.32 | 18 | 86.3 | 39 | 7.31 | 4 | 8.5 |
| 11 | 4.4 | 27 | 84.5 | 40 | 7.45 | 5 | 8.1 |
| 12 | 4.48 | 29 | 81.8 | 41 | 7.58 | 6 | 7.6 |
| 13 | 4.56 | 28 | 78.9 | 42 | 7.72 | 2 | 7 |
| 14 | 4.65 | 46 | 76.1 | 43 | 7.86 | 1 | 6.8 |
| 15 | 4.73 | 52 | 71.5 | 44 | 8.01 | 3 | 6.7 |
| 16 | 4.82 | 63 | 66.3 | 45 | 8.16 | 2 | 6.4 |
| 17 | 4.91 | 51 | 60 | 46 | 8.3 | 8 | 6.2 |
| 18 | 5 | 70 | 54.9 | 47 | 8.46 | 1 | 5.4 |
| 19 | 5.09 | 40 | 47.9 | 48 | 8.61 | 1 | 5.3 |
| 20 | 5.18 | 45 | 43.9 | 49 | 8.77 | 4 | 5.2 |
| 21 | 5.28 | 37 | 39.4 | 50 | 8.93 | 3 | 4.8 |
| 22 | 5.37 | 25 | 35.7 | 51 | 9.09 | 2 | 4.5 |
| 23 | 5.47 | 36 | 33.2 | 52 | 9.26 | 4 | 4.3 |
| 24 | 5.57 | 28 | 29.6 | 53 | 9.43 | 3 | 3.9 |
| 25 | 5.67 | 29 | 26.8 | 54 | 9.6 | 2 | 3.6 |
| 26 | 5.78 | 20 | 23.9 | 55 | 9.78 | 1 | 3.4 |
| 27 | 5.88 | 19 | 21.9 | 56 | 9.96 | 5 | 3.3 |
| 28 | 5.99 | 11 | 20 | 57 | 10.14 | 1 | 2.8 |
| 29 | 6.1 | 17 | 18.9 | 58 | 10.32 | 3 | 2.7 |
| 30 | 6.21 | 15 | 17.2 | 59 | 10.51 | 1 | 2.4 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 60 | 10.7 | 0 | 2.3 | 89 | 18.11 | 0 | 0.4 |
| 61 | 10.9 | 2 | 2.3 | 90 | 18.44 | 0 | 0.4 |
| 62 | 11.1 | 2 | 2.1 | 91 | 18.78 | 0 | 0.4 |
| 63 | 11.3 | 0 | 1.9 | 92 | 19.12 | 0 | 0.4 |
| 64 | 11.51 | 1 | 1.9 | 93 | 19.47 | 0 | 0.4 |
| 65 | 11.72 | 2 | 1.8 | 94 | 19.83 | 2 | 0.4 |
| 66 | 11.93 | 0 | 1.6 | 95 | 20.19 | 0 | 0.2 |
| 67 | 12.15 | 0 | 1.6 | 96 | 20.56 | 0 | 0.2 |
| 68 | 12.37 | 1 | 1.6 | 97 | 20.93 | 0 | 0.2 |
| 69 | 12.6 | 1 | 1.5 | 98 | 21.32 | 1 | 0.2 |
| 70 | 12.83 | 1 | 1.4 | 99 | 21.71 | 0 | 0.1 |
| 71 | 13.07 | 1 | 1.3 | 100 | 22.1 | 0 | 0.1 |
| 72 | 13.31 | 0 | 1.2 | 101 | 22.51 | 0 | 0.1 |
| 73 | 13.55 | 1 | 1.2 | 102 | 22.92 | 0 | 0.1 |
| 74 | 13.8 | 1 | 1.1 | 103 | 23.34 | 0 | 0.1 |
| 75 | 14.05 | 2 | 1 | 104 | 23.77 | 0 | 0.1 |
| 76 | 14.31 | 0 | 0.8 | 105 | 24.2 | 0 | 0.1 |
| 77 | 14.57 | 0 | 0.8 | 106 | 24.65 | 0 | 0.1 |
| 78 | 14.83 | 0 | 0.8 | 107 | 25.1 | 0 | 0.1 |
| 79 | 15.11 | 1 | 0.8 | 108 | 25.56 | 0 | 0.1 |
| 80 | 15.38 | 0 | 0.7 | 109 | 26.02 | 0 | 0.1 |
| 81 | 15.66 | 1 | 0.7 | 110 | 26.5 | 0 | 0.1 |
| 82 | 15.95 | 1 | 0.6 | 111 | 26.98 | 0 | 0.1 |
| 83 | 16.24 | 0 | 0.5 | 112 | 27.48 | 0 | 0.1 |
| 84 | 16.54 | 0 | 0.5 | 113 | 27.98 | 0 | 0.1 |
| 85 | 16.84 | 1 | 0.5 | 114 | 28.49 | 0 | 0.1 |

| | | | | | | | |
|----|-------|---|-----|-----|-------|---|-----|
| 86 | 17.15 | 0 | 0.4 | 115 | 29.01 | 1 | 0.1 |
| 87 | 17.46 | 0 | 0.4 | | | | |
| 88 | 17.78 | 0 | 0.4 | | | | |

| GAS PRIME: Aspirin/Methanol MS#55.dat | | | | | | | |
|---------------------------------------|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 2 | 3.74 | 8 | 100 | 34 | 6.68 | 58 | 30.59 |
| 3 | 3.81 | 35 | 99.81 | 35 | 6.8 | 62 | 29.24 |
| 4 | 3.88 | 120 | 99 | 36 | 6.93 | 61 | 27.81 |
| 5 | 3.95 | 124 | 96.23 | 37 | 7.05 | 48 | 26.39 |
| 6 | 4.02 | 122 | 93.35 | 38 | 7.18 | 73 | 25.28 |
| 7 | 4.09 | 111 | 90.53 | 39 | 7.31 | 42 | 23.59 |
| 8 | 4.17 | 98 | 87.96 | 40 | 7.45 | 51 | 22.62 |
| 9 | 4.24 | 87 | 85.69 | 41 | 7.58 | 47 | 21.44 |
| 10 | 4.32 | 118 | 83.68 | 42 | 7.72 | 47 | 20.35 |
| 11 | 4.4 | 106 | 80.94 | 43 | 7.86 | 39 | 19.26 |
| 12 | 4.48 | 112 | 78.49 | 44 | 8.01 | 32 | 18.36 |
| 13 | 4.56 | 101 | 75.9 | 45 | 8.16 | 39 | 17.62 |
| 14 | 4.65 | 102 | 73.56 | 46 | 8.3 | 39 | 16.72 |
| 15 | 4.73 | 93 | 71.2 | 47 | 8.46 | 36 | 15.81 |
| 16 | 4.82 | 122 | 69.04 | 48 | 8.61 | 37 | 14.98 |
| 17 | 4.91 | 95 | 66.22 | 49 | 8.77 | 24 | 14.12 |
| 18 | 5 | 107 | 64.02 | 50 | 8.93 | 37 | 13.57 |
| 19 | 5.09 | 110 | 61.54 | 51 | 9.09 | 22 | 12.71 |
| 20 | 5.18 | 115 | 59 | 52 | 9.26 | 31 | 12.2 |
| 21 | 5.28 | 111 | 56.33 | 53 | 9.43 | 28 | 11.48 |
| 22 | 5.37 | 96 | 53.76 | 54 | 9.6 | 27 | 10.84 |
| 23 | 5.47 | 112 | 51.54 | 55 | 9.78 | 29 | 10.21 |
| 24 | 5.57 | 79 | 48.95 | 56 | 9.96 | 21 | 9.54 |
| 25 | 5.67 | 85 | 47.12 | 57 | 10.14 | 17 | 9.05 |
| 26 | 5.78 | 84 | 45.15 | 58 | 10.32 | 23 | 8.66 |
| 27 | 5.88 | 94 | 43.2 | 59 | 10.51 | 18 | 8.13 |
| 28 | 5.99 | 83 | 41.03 | 60 | 10.7 | 22 | 7.71 |
| 29 | 6.1 | 84 | 39.11 | 61 | 10.9 | 15 | 7.2 |
| 30 | 6.21 | 92 | 37.16 | 62 | 11.1 | 8 | 6.85 |
| 31 | 6.33 | 62 | 35.03 | 63 | 11.3 | 19 | 6.67 |
| 32 | 6.44 | 73 | 33.6 | 64 | 11.51 | 13 | 6.23 |
| 33 | 6.56 | 57 | 31.91 | 65 | 11.72 | 15 | 5.93 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 11.93 | 16 | 5.58 | 98 | 21.32 | 3 | 0.53 |
| 67 | 12.15 | 17 | 5.21 | 99 | 21.71 | 2 | 0.46 |
| 68 | 12.37 | 7 | 4.82 | 100 | 22.1 | 0 | 0.42 |
| 69 | 12.6 | 18 | 4.65 | 101 | 22.51 | 1 | 0.42 |
| 70 | 12.83 | 13 | 4.24 | 102 | 22.92 | 1 | 0.39 |
| 71 | 13.07 | 9 | 3.94 | 103 | 23.34 | 2 | 0.37 |
| 72 | 13.31 | 1 | 3.73 | 104 | 23.77 | 3 | 0.32 |
| 73 | 13.55 | 9 | 3.7 | 105 | 24.2 | 2 | 0.25 |
| 74 | 13.8 | 6 | 3.5 | 106 | 24.65 | 1 | 0.21 |
| 75 | 14.05 | 18 | 3.36 | 107 | 25.1 | 0 | 0.19 |
| 76 | 14.31 | 5 | 2.94 | 108 | 25.56 | 1 | 0.19 |
| 77 | 14.57 | 9 | 2.82 | 109 | 26.02 | 0 | 0.16 |
| 78 | 14.83 | 7 | 2.62 | 110 | 26.5 | 1 | 0.16 |
| 79 | 15.11 | 9 | 2.45 | 111 | 26.98 | 0 | 0.14 |
| 80 | 15.38 | 7 | 2.25 | 112 | 27.48 | 0 | 0.14 |
| 81 | 15.66 | 5 | 2.08 | 113 | 27.98 | 0 | 0.14 |
| 82 | 15.95 | 1 | 1.97 | 114 | 28.49 | 1 | 0.14 |
| 83 | 16.24 | 13 | 1.94 | 115 | 29.01 | 1 | 0.12 |
| 84 | 16.54 | 10 | 1.64 | 116 | 29.55 | 0 | 0.09 |
| 85 | 16.84 | 2 | 1.41 | 117 | 30.09 | 0 | 0.09 |
| 86 | 17.15 | 6 | 1.37 | 118 | 30.64 | 0 | 0.09 |
| 87 | 17.46 | 2 | 1.23 | 119 | 31.2 | 0 | 0.09 |
| 88 | 17.78 | 1 | 1.18 | 120 | 31.77 | 0 | 0.09 |
| 89 | 18.11 | 7 | 1.16 | 121 | 32.35 | 0 | 0.09 |
| 90 | 18.44 | 3 | 1 | 122 | 32.94 | 0 | 0.09 |
| 91 | 18.78 | 3 | 0.93 | 123 | 33.55 | 0 | 0.09 |
| 92 | 19.12 | 4 | 0.86 | 124 | 34.16 | 2 | 0.09 |

| | | | | | | | |
|----|-------|---|------|-----|-------|---|------|
| 93 | 19.47 | 2 | 0.76 | 125 | 34.78 | 0 | 0.05 |
| 94 | 19.83 | 3 | 0.72 | 126 | 35.42 | 0 | 0.05 |
| 95 | 20.19 | 0 | 0.65 | 127 | 36.07 | 1 | 0.05 |
| 96 | 20.56 | 3 | 0.65 | 128 | 36.73 | 1 | 0.02 |
| 97 | 20.93 | 2 | 0.58 | | | | |

| GAS process Acetaminophen/n-Butanol : 3 min to 1100 psi MS#61.dat | | | | | | | |
|---|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 8 | 7.24 | 3 | 100 | 37 | 11.8 | 22 | 34.11 |
| 9 | 7.36 | 13 | 99.81 | 38 | 12 | 17 | 32.69 |
| 10 | 7.48 | 19 | 98.97 | 39 | 12.2 | 14 | 31.59 |
| 11 | 7.61 | 41 | 97.74 | 40 | 12.41 | 24 | 30.69 |
| 12 | 7.74 | 42 | 95.1 | 41 | 12.62 | 20 | 29.14 |
| 13 | 7.87 | 45 | 92.39 | 42 | 12.83 | 18 | 27.85 |
| 14 | 8.01 | 44 | 89.49 | 43 | 13.05 | 12 | 26.69 |
| 15 | 8.14 | 53 | 86.65 | 44 | 13.27 | 19 | 25.92 |
| 16 | 8.28 | 47 | 83.24 | 45 | 13.5 | 14 | 24.69 |
| 17 | 8.42 | 38 | 80.21 | 46 | 13.73 | 10 | 23.79 |
| 18 | 8.56 | 47 | 77.76 | 47 | 13.96 | 12 | 23.15 |
| 19 | 8.71 | 43 | 74.73 | 48 | 14.2 | 14 | 22.37 |
| 20 | 8.86 | 44 | 71.95 | 49 | 14.44 | 6 | 21.47 |
| 21 | 9.01 | 39 | 69.12 | 50 | 14.68 | 11 | 21.08 |
| 22 | 9.16 | 52 | 66.6 | 51 | 14.93 | 13 | 20.37 |
| 23 | 9.32 | 45 | 63.25 | 52 | 15.19 | 9 | 19.54 |
| 24 | 9.48 | 42 | 60.35 | 53 | 15.45 | 12 | 18.96 |
| 25 | 9.64 | 52 | 57.64 | 54 | 15.71 | 15 | 18.18 |
| 26 | 9.8 | 44 | 54.29 | 55 | 15.98 | 9 | 17.21 |
| 27 | 9.97 | 26 | 51.45 | 56 | 16.25 | 10 | 16.63 |
| 28 | 10.14 | 47 | 49.77 | 57 | 16.52 | 10 | 15.99 |
| 29 | 10.31 | 33 | 46.74 | 58 | 16.81 | 10 | 15.34 |
| 30 | 10.48 | 25 | 44.62 | 59 | 17.09 | 10 | 14.7 |
| 31 | 10.66 | 24 | 43 | 60 | 17.38 | 6 | 14.06 |
| 32 | 10.84 | 23 | 41.46 | 61 | 17.68 | 8 | 13.67 |
| 33 | 11.03 | 14 | 39.97 | 62 | 17.98 | 7 | 13.15 |
| 34 | 11.21 | 19 | 39.07 | 63 | 18.28 | 7 | 12.7 |
| 35 | 11.4 | 36 | 37.85 | 64 | 18.6 | 9 | 12.25 |
| 36 | 11.6 | 22 | 35.53 | 65 | 18.91 | 7 | 11.67 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 19.23 | 11 | 11.22 | 95 | 31.36 | 0 | 3.09 |
| 67 | 19.56 | 7 | 10.51 | 96 | 31.89 | 0 | 3.09 |
| 68 | 19.89 | 8 | 10.06 | 97 | 32.43 | 4 | 3.09 |
| 69 | 20.23 | 4 | 9.54 | 98 | 32.98 | 2 | 2.84 |
| 70 | 20.57 | 4 | 9.28 | 99 | 33.55 | 2 | 2.71 |
| 71 | 20.92 | 3 | 9.03 | 100 | 34.12 | 5 | 2.58 |
| 72 | 21.28 | 4 | 8.83 | 101 | 34.7 | 2 | 2.26 |
| 73 | 21.64 | 5 | 8.58 | 102 | 35.29 | 5 | 2.13 |
| 74 | 22.01 | 9 | 8.25 | 103 | 35.89 | 0 | 1.81 |
| 75 | 22.38 | 5 | 7.67 | 104 | 36.5 | 2 | 1.81 |
| 76 | 22.77 | 3 | 7.35 | 105 | 37.12 | 1 | 1.68 |
| 77 | 23.15 | 4 | 7.16 | 106 | 37.75 | 5 | 1.61 |
| 78 | 23.55 | 4 | 6.9 | 107 | 38.39 | 3 | 1.29 |
| 79 | 23.95 | 2 | 6.64 | 108 | 39.04 | 1 | 1.1 |
| 80 | 24.35 | 3 | 6.51 | 109 | 39.71 | 0 | 1.03 |
| 81 | 24.77 | 5 | 6.32 | 110 | 40.38 | 1 | 1.03 |
| 82 | 25.19 | 1 | 6 | 111 | 41.07 | 2 | 0.97 |
| 83 | 25.62 | 3 | 5.93 | 112 | 41.76 | 0 | 0.84 |
| 84 | 26.05 | 6 | 5.74 | 113 | 42.47 | 2 | 0.84 |
| 85 | 26.49 | 3 | 5.35 | 114 | 43.2 | 1 | 0.71 |
| 86 | 26.94 | 5 | 5.16 | 115 | 43.93 | 1 | 0.64 |
| 87 | 27.4 | 4 | 4.84 | 116 | 44.68 | 2 | 0.58 |
| 88 | 27.87 | 4 | 4.58 | 117 | 45.44 | 4 | 0.45 |
| 89 | 28.34 | 1 | 4.32 | 118 | 46.21 | 0 | 0.19 |
| 90 | 28.82 | 2 | 4.26 | 119 | 47 | 1 | 0.19 |
| 91 | 29.31 | 6 | 4.13 | 120 | 47.79 | 0 | 0.13 |
| 92 | 29.81 | 2 | 3.74 | 121 | 48.61 | 1 | 0.13 |

| | | | | | | | |
|----|-------|---|------|-----|-------|---|------|
| 93 | 30.32 | 4 | 3.61 | 122 | 49.43 | 1 | 0.06 |
| 94 | 30.83 | 4 | 3.35 | | | | |

| GAS PROCESS : Acetaminophen/Butanol- 1 min to 1100 psi MS#62.dat | | | | | | | |
|--|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 6 | 7 | 1 | 100 | 33 | 11.03 | 14 | 46.54 |
| 7 | 7.11 | 0 | 99.89 | 34 | 11.21 | 15 | 45.02 |
| 8 | 7.24 | 4 | 99.89 | 35 | 11.4 | 23 | 43.4 |
| 9 | 7.36 | 5 | 99.46 | 36 | 11.6 | 20 | 40.91 |
| 10 | 7.48 | 8 | 98.92 | 37 | 11.8 | 13 | 38.74 |
| 11 | 7.61 | 25 | 98.05 | 38 | 12 | 6 | 37.34 |
| 12 | 7.74 | 32 | 95.35 | 39 | 12.2 | 14 | 36.69 |
| 13 | 7.87 | 21 | 91.88 | 40 | 12.41 | 17 | 35.17 |
| 14 | 8.01 | 28 | 89.61 | 41 | 12.62 | 19 | 33.33 |
| 15 | 8.14 | 28 | 86.58 | 42 | 12.83 | 19 | 31.28 |
| 16 | 8.28 | 22 | 83.55 | 43 | 13.05 | 11 | 29.22 |
| 17 | 8.42 | 26 | 81.17 | 44 | 13.27 | 24 | 28.03 |
| 18 | 8.56 | 15 | 78.35 | 45 | 13.5 | 11 | 25.43 |
| 19 | 8.71 | 13 | 76.73 | 46 | 13.73 | 16 | 24.24 |
| 20 | 8.86 | 22 | 75.32 | 47 | 13.96 | 10 | 22.51 |
| 21 | 9.01 | 17 | 72.94 | 48 | 14.2 | 14 | 21.43 |
| 22 | 9.16 | 20 | 71.1 | 49 | 14.44 | 8 | 19.91 |
| 23 | 9.32 | 21 | 68.94 | 50 | 14.68 | 11 | 19.05 |
| 24 | 9.48 | 29 | 66.67 | 51 | 14.93 | 11 | 17.86 |
| 25 | 9.64 | 18 | 63.53 | 52 | 15.19 | 8 | 16.67 |
| 26 | 9.8 | 25 | 61.58 | 53 | 15.45 | 5 | 15.8 |
| 27 | 9.97 | 27 | 58.87 | 54 | 15.71 | 7 | 15.26 |
| 28 | 10.14 | 23 | 55.95 | 55 | 15.98 | 12 | 14.5 |
| 29 | 10.31 | 16 | 53.46 | 56 | 16.25 | 3 | 13.2 |
| 30 | 10.48 | 20 | 51.73 | 57 | 16.52 | 5 | 12.88 |
| 31 | 10.66 | 16 | 49.57 | 58 | 16.81 | 9 | 12.34 |
| 32 | 10.84 | 12 | 47.84 | 59 | 17.09 | 8 | 11.36 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 60 | 17.38 | 3 | 10.5 | 87 | 27.4 | 2 | 1.73 |
| 61 | 17.68 | 13 | 10.17 | 88 | 27.87 | 2 | 1.52 |
| 62 | 17.98 | 6 | 8.77 | 89 | 28.34 | 0 | 1.3 |
| 63 | 18.28 | 2 | 8.12 | 90 | 28.82 | 1 | 1.3 |
| 64 | 18.6 | 7 | 7.9 | 91 | 29.31 | 1 | 1.19 |
| 65 | 18.91 | 3 | 7.14 | 92 | 29.81 | 0 | 1.08 |
| 66 | 19.23 | 4 | 6.82 | 93 | 30.32 | 1 | 1.08 |
| 67 | 19.56 | 3 | 6.39 | 94 | 30.83 | 2 | 0.97 |
| 68 | 19.89 | 6 | 6.06 | 95 | 31.36 | 0 | 0.76 |
| 69 | 20.23 | 3 | 5.41 | 96 | 31.89 | 0 | 0.76 |
| 70 | 20.57 | 2 | 5.09 | 97 | 32.43 | 0 | 0.76 |
| 71 | 20.92 | 0 | 4.87 | 98 | 32.98 | 0 | 0.76 |
| 72 | 21.28 | 4 | 4.87 | 99 | 33.55 | 0 | 0.76 |
| 73 | 21.64 | 2 | 4.44 | 100 | 34.12 | 0 | 0.76 |
| 74 | 22.01 | 3 | 4.22 | 101 | 34.7 | 0 | 0.76 |
| 75 | 22.38 | 0 | 3.9 | 102 | 35.29 | 1 | 0.76 |
| 76 | 22.77 | 2 | 3.9 | 103 | 35.89 | 1 | 0.65 |
| 77 | 23.15 | 1 | 3.68 | 104 | 36.5 | 1 | 0.54 |
| 78 | 23.55 | 2 | 3.57 | 105 | 37.12 | 0 | 0.43 |
| 79 | 23.95 | 2 | 3.35 | 106 | 37.75 | 0 | 0.43 |
| 80 | 24.35 | 2 | 3.14 | 107 | 38.39 | 1 | 0.43 |
| 81 | 24.77 | 5 | 2.92 | 108 | 39.04 | 0 | 0.32 |
| 82 | 25.19 | 1 | 2.38 | 109 | 39.71 | 1 | 0.32 |
| 83 | 25.62 | 1 | 2.27 | 110 | 40.38 | 1 | 0.22 |
| 84 | 26.05 | 3 | 2.16 | 111 | 41.07 | 0 | 0.11 |
| 85 | 26.49 | 1 | 1.84 | 112 | 41.76 | 0 | 0.11 |
| 86 | 26.94 | 0 | 1.73 | 113 | 42.47 | 1 | 0.11 |

| GAS PROCESS: Acetaminophen/Butanol- 40 secs to 1100 psi MS#63.dat | | | | | | | | | |
|---|-------|--------|---------|------|-------|--------|---------|--|--|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger | | |
| 6 | 7 | 1 | 100 | 35 | 11.4 | 69 | 15.95 | | |
| 7 | 7.11 | 1 | 99.98 | 36 | 11.6 | 70 | 14.28 | | |
| 8 | 7.24 | 15 | 99.95 | 37 | 11.8 | 59 | 12.59 | | |
| 9 | 7.36 | 27 | 99.59 | 38 | 12 | 56 | 11.16 | | |
| 10 | 7.48 | 59 | 98.94 | 39 | 12.2 | 24 | 9.81 | | |
| 11 | 7.61 | 114 | 97.51 | 40 | 12.41 | 18 | 9.23 | | |
| 12 | 7.74 | 214 | 94.76 | 41 | 12.62 | 13 | 8.79 | | |
| 13 | 7.87 | 251 | 89.59 | 42 | 12.83 | 24 | 8.48 | | |
| 14 | 8.01 | 162 | 83.52 | 43 | 13.05 | 36 | 7.9 | | |
| 15 | 8.14 | 157 | 79.61 | 44 | 13.27 | 28 | 7.03 | | |
| 16 | 8.28 | 165 | 75.82 | 45 | 13.5 | 10 | 6.35 | | |
| 17 | 8.42 | 175 | 71.83 | 46 | 13.73 | 17 | 6.11 | | |
| 18 | 8.56 | 185 | 67.6 | 47 | 13.96 | 13 | 5.7 | | |
| 19 | 8.71 | 191 | 63.13 | 48 | 14.2 | 17 | 5.39 | | |
| 20 | 8.86 | 145 | 58.52 | 49 | 14.44 | 5 | 4.98 | | |
| 21 | 9.01 | 170 | 55.01 | 50 | 14.68 | 19 | 4.86 | | |
| 22 | 9.16 | 189 | 50.91 | 51 | 14.93 | 5 | 4.4 | | |
| 23 | 9.32 | 158 | 46.34 | 52 | 15.19 | 8 | 4.28 | | |
| 24 | 9.48 | 140 | 42.52 | 53 | 15.45 | 13 | 4.08 | | |
| 25 | 9.64 | 110 | 39.14 | 54 | 15.71 | 8 | 3.77 | | |
| 26 | 9.8 | 111 | 36.48 | 55 | 15.98 | 12 | 3.58 | | |
| 27 | 9.97 | 94 | 33.8 | 56 | 16.25 | 7 | 3.29 | | |
| 28 | 10.14 | 90 | 31.53 | 57 | 16.52 | 6 | 3.12 | | |
| 29 | 10.31 | 113 | 29.35 | 58 | 16.81 | 9 | 2.97 | | |
| 30 | 10.48 | 95 | 26.62 | 59 | 17.09 | 9 | 2.75 | | |
| 31 | 10.66 | 93 | 24.33 | 60 | 17.38 | 5 | 2.54 | | |
| 32 | 10.84 | 92 | 22.08 | 61 | 17.68 | 3 | 2.42 | | |
| 33 | 11.03 | 71 | 19.86 | 62 | 17.98 | 4 | 2.34 | | |
| 34 | 11.21 | 91 | 18.14 | 63 | 18.28 | 8 | 2.25 | | |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger | | |
| 64 | 18.6 | 6 | 2.05 | 93 | 30.32 | 0 | 0.34 | | |
| 65 | 18.91 | 4 | 1.91 | 94 | 30.83 | 1 | 0.34 | | |
| 66 | 19.23 | 6 | 1.81 | 95 | 31.36 | 0 | 0.31 | | |
| 67 | 19.56 | 7 | 1.67 | 96 | 31.89 | 1 | 0.31 | | |
| 68 | 19.89 | 1 | 1.5 | 97 | 32.43 | 1 | 0.29 | | |
| 69 | 20.23 | 3 | 1.47 | 98 | 32.98 | 1 | 0.27 | | |
| 70 | 20.57 | 3 | 1.4 | 99 | 33.55 | 0 | 0.24 | | |
| 71 | 20.92 | 5 | 1.33 | 100 | 34.12 | 0 | 0.24 | | |
| 72 | 21.28 | 4 | 1.21 | 101 | 34.7 | 0 | 0.24 | | |
| 73 | 21.64 | 2 | 1.11 | 102 | 35.29 | 0 | 0.24 | | |
| 74 | 22.01 | 0 | 1.06 | 103 | 35.89 | 1 | 0.24 | | |
| 75 | 22.38 | 1 | 1.06 | 104 | 36.5 | 1 | 0.22 | | |
| 76 | 22.77 | 4 | 1.04 | 105 | 37.12 | 1 | 0.19 | | |
| 77 | 23.15 | 4 | 0.94 | 106 | 37.75 | 1 | 0.17 | | |
| 78 | 23.55 | 1 | 0.85 | 107 | 38.39 | 0 | 0.14 | | |
| 79 | 23.95 | 3 | 0.82 | 108 | 39.04 | 0 | 0.14 | | |
| 80 | 24.35 | 2 | 0.75 | 109 | 39.71 | 0 | 0.14 | | |
| 81 | 24.77 | 4 | 0.7 | 110 | 40.38 | 0 | 0.14 | | |
| 82 | 25.19 | 2 | 0.6 | 111 | 41.07 | 1 | 0.14 | | |
| 83 | 25.62 | 2 | 0.56 | 112 | 41.76 | 0 | 0.12 | | |
| 84 | 26.05 | 1 | 0.51 | 113 | 42.47 | 1 | 0.12 | | |
| 85 | 26.49 | 0 | 0.48 | 114 | 43.2 | 1 | 0.1 | | |
| 86 | 26.94 | 0 | 0.48 | 115 | 43.93 | 1 | 0.07 | | |
| 87 | 27.4 | 1 | 0.48 | 116 | 44.68 | 0 | 0.05 | | |
| 88 | 27.87 | 1 | 0.46 | 117 | 45.44 | 0 | 0.05 | | |
| 89 | 28.34 | 2 | 0.43 | 118 | 46.21 | 1 | 0.05 | | |
| 90 | 28.82 | 0 | 0.39 | 119 | 47 | 0 | 0.02 | | |
| 91 | 29.31 | 1 | 0.39 | 120 | 47.79 | 0 | 0.02 | | |
| 92 | 29.81 | 1 | 0.36 | 121 | 48.61 | 1 | 0.02 | | |

| GAS PROCESSES: Acetaminophen/Butanol 30 min holding time at 1000 psi MS#64.dat | | | | | | | |
|--|-------|--------|---------|------|-------|--------|---------|
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 2 | 8.26 | 26 | 100 | 34 | 15.37 | 271 | 44.86 |
| 3 | 8.42 | 20 | 99.69 | 35 | 15.67 | 284 | 41.58 |
| 4 | 8.59 | 95 | 99.44 | 36 | 15.98 | 310 | 38.14 |
| 5 | 8.75 | 18 | 98.29 | 37 | 16.29 | 267 | 34.38 |
| 6 | 8.93 | 15 | 98.07 | 38 | 16.61 | 275 | 31.15 |
| 7 | 9.1 | 28 | 97.89 | 39 | 16.94 | 196 | 27.82 |
| 8 | 9.28 | 217 | 97.55 | 40 | 17.27 | 188 | 25.45 |
| 9 | 9.46 | 48 | 94.93 | 41 | 17.61 | 147 | 23.17 |
| 10 | 9.65 | 69 | 94.34 | 42 | 17.95 | 156 | 21.39 |
| 11 | 9.84 | 92 | 93.51 | 43 | 18.3 | 98 | 19.5 |
| 12 | 10.03 | 126 | 92.39 | 44 | 18.66 | 115 | 18.31 |
| 13 | 10.23 | 133 | 90.87 | 45 | 19.03 | 79 | 16.92 |
| 14 | 10.43 | 123 | 89.26 | 46 | 19.4 | 98 | 15.96 |
| 15 | 10.63 | 144 | 87.77 | 47 | 19.78 | 67 | 14.78 |
| 16 | 10.84 | 464 | 86.02 | 48 | 20.17 | 105 | 13.96 |
| 17 | 11.05 | 140 | 80.4 | 49 | 20.56 | 40 | 12.69 |
| 18 | 11.27 | 130 | 78.71 | 50 | 20.97 | 56 | 12.21 |
| 19 | 11.49 | 145 | 77.13 | 51 | 21.38 | 40 | 11.53 |
| 20 | 11.71 | 145 | 75.38 | 52 | 21.8 | 72 | 11.05 |
| 21 | 11.94 | 167 | 73.62 | 53 | 22.22 | 29 | 10.17 |
| 22 | 12.18 | 185 | 71.6 | 54 | 22.66 | 53 | 9.82 |
| 23 | 12.42 | 185 | 69.36 | 55 | 23.1 | 20 | 9.18 |
| 24 | 12.66 | 187 | 67.12 | 56 | 23.56 | 75 | 8.94 |
| 25 | 12.91 | 144 | 64.85 | 57 | 24.02 | 19 | 8.03 |
| 26 | 13.16 | 180 | 63.11 | 58 | 24.49 | 24 | 7.8 |
| 27 | 13.42 | 155 | 60.93 | 59 | 24.97 | 21 | 7.51 |
| 28 | 13.68 | 168 | 59.05 | 60 | 25.46 | 33 | 7.25 |
| 29 | 13.95 | 171 | 57.02 | 61 | 25.96 | 9 | 6.85 |
| 30 | 14.22 | 177 | 54.95 | 62 | 26.47 | 14 | 6.75 |
| 31 | 14.5 | 185 | 52.8 | 63 | 26.99 | 13 | 6.58 |
| 32 | 14.78 | 215 | 50.56 | 64 | 27.51 | 48 | 6.42 |
| 33 | 15.07 | 256 | 47.96 | 65 | 28.05 | 12 | 5.84 |
| Chnl | Size | Counts | %larger | Chnl | Size | Counts | %larger |
| 66 | 28.6 | 8 | 5.69 | 98 | 53.24 | 2 | 1.77 |
| 67 | 29.16 | 11 | 5.6 | 99 | 54.28 | 5 | 1.74 |
| 68 | 29.74 | 11 | 5.46 | 100 | 55.34 | 8 | 1.68 |
| 69 | 30.32 | 15 | 5.33 | 101 | 56.43 | 9 | 1.59 |
| 70 | 30.91 | 12 | 5.15 | 102 | 57.53 | 4 | 1.48 |
| 71 | 31.52 | 20 | 5 | 103 | 58.66 | 5 | 1.43 |
| 72 | 32.14 | 13 | 4.76 | 104 | 59.81 | 8 | 1.37 |
| 73 | 32.77 | 16 | 4.6 | 105 | 60.98 | 8 | 1.27 |
| 74 | 33.41 | 12 | 4.41 | 106 | 62.18 | 9 | 1.17 |
| 75 | 34.06 | 14 | 4.26 | 107 | 63.4 | 5 | 1.07 |
| 76 | 34.73 | 15 | 4.09 | 108 | 64.64 | 6 | 1.01 |
| 77 | 35.41 | 15 | 3.91 | 109 | 65.91 | 5 | 0.93 |
| 78 | 36.11 | 8 | 3.73 | 110 | 67.2 | 1 | 0.87 |
| 79 | 36.82 | 7 | 3.63 | 111 | 68.52 | 8 | 0.86 |
| 80 | 37.54 | 13 | 3.55 | 112 | 69.86 | 4 | 0.76 |
| 81 | 38.27 | 11 | 3.39 | 113 | 71.23 | 10 | 0.71 |
| 82 | 39.02 | 9 | 3.26 | 114 | 72.62 | 3 | 0.59 |
| 83 | 39.79 | 16 | 3.15 | 115 | 74.05 | 4 | 0.56 |
| 84 | 40.57 | 3 | 2.96 | 116 | 75.5 | 1 | 0.51 |
| 85 | 41.36 | 11 | 2.92 | 117 | 76.98 | 6 | 0.5 |
| 86 | 42.17 | 5 | 2.79 | 118 | 78.49 | 8 | 0.42 |
| 87 | 43 | 8 | 2.72 | 119 | 80.03 | 3 | 0.33 |
| 88 | 43.84 | 5 | 2.63 | 120 | 81.59 | 3 | 0.29 |
| 89 | 44.7 | 9 | 2.57 | 121 | 83.19 | 3 | 0.25 |
| 90 | 45.58 | 7 | 2.46 | 122 | 84.82 | 2 | 0.22 |
| 91 | 46.47 | 6 | 2.37 | 123 | 86.49 | 3 | 0.19 |
| 92 | 47.38 | 5 | 2.3 | 124 | 88.18 | 3 | 0.16 |
| 93 | 48.31 | 7 | 2.24 | 125 | 89.91 | 0 | 0.12 |
| 94 | 49.26 | 11 | 2.16 | 126 | 91.67 | 3 | 0.12 |
| 95 | 50.22 | 5 | 2.02 | 127 | 93.47 | 2 | 0.08 |
| 96 | 51.21 | 4 | 1.96 | 128 | 95.3 | 5 | 0.06 |
| 97 | 52.21 | 12 | 1.91 | | | | |

| GAS PRIME: Acetaminophen/ethanol | | | | | | MS#70.dat | | | |
|----------------------------------|-------|--------|---------|------|-------|-----------|---------|--|--|
| Chnl | size | counts | %larger | Chnl | size | counts | %larger | | |
| 10 | 4.32 | 4 | 100 | 37 | 7.05 | 5 | 18.81 | | |
| 11 | 4.4 | 52 | 99.6 | 38 | 7.18 | 5 | 18.31 | | |
| 12 | 4.48 | 135 | 94.43 | 39 | 7.31 | 9 | 17.81 | | |
| 13 | 4.56 | 103 | 81 | 40 | 7.45 | 6 | 16.92 | | |
| 14 | 4.65 | 93 | 70.75 | 41 | 7.58 | 5 | 16.32 | | |
| 15 | 4.73 | 66 | 61.49 | 42 | 7.72 | 5 | 15.82 | | |
| 16 | 4.82 | 57 | 54.93 | 43 | 7.86 | 4 | 15.32 | | |
| 17 | 4.91 | 35 | 49.25 | 44 | 8.01 | 2 | 14.93 | | |
| 18 | 5 | 41 | 45.77 | 45 | 8.16 | 4 | 14.73 | | |
| 19 | 5.09 | 34 | 41.69 | 46 | 8.3 | 6 | 14.33 | | |
| 20 | 5.18 | 20 | 38.31 | 47 | 8.46 | 2 | 13.73 | | |
| 21 | 5.28 | 19 | 36.32 | 48 | 8.61 | 3 | 13.53 | | |
| 22 | 5.37 | 13 | 34.43 | 49 | 8.77 | 5 | 13.23 | | |
| 23 | 5.47 | 11 | 33.13 | 50 | 8.93 | 6 | 12.74 | | |
| 24 | 5.57 | 12 | 32.04 | 51 | 9.09 | 4 | 12.14 | | |
| 25 | 5.67 | 16 | 30.85 | 52 | 9.26 | 4 | 11.74 | | |
| 26 | 5.78 | 6 | 29.25 | 53 | 9.43 | 6 | 11.34 | | |
| 27 | 5.88 | 11 | 28.66 | 54 | 9.6 | 5 | 10.75 | | |
| 28 | 5.99 | 5 | 27.56 | 55 | 9.78 | 4 | 10.25 | | |
| 29 | 6.1 | 15 | 27.06 | 56 | 9.96 | 1 | 9.85 | | |
| 30 | 6.21 | 7 | 25.57 | 57 | 10.14 | 4 | 9.75 | | |
| 31 | 6.33 | 7 | 24.88 | 58 | 10.32 | 5 | 9.35 | | |
| 32 | 6.44 | 6 | 24.18 | 59 | 10.51 | 3 | 8.86 | | |
| 33 | 6.56 | 9 | 23.58 | 60 | 10.7 | 3 | 8.56 | | |
| 34 | 6.68 | 12 | 22.69 | 61 | 10.9 | 2 | 8.26 | | |
| 35 | 6.8 | 13 | 21.49 | 62 | 11.1 | 5 | 8.06 | | |
| 36 | 6.93 | 14 | 20.2 | 63 | 11.3 | 5 | 7.56 | | |
| Chnl | size | Counts | %larger | Chnl | size | counts | %larger | | |
| 64 | 11.51 | 3 | 7.06 | 91 | 18.78 | 0 | 1.19 | | |
| 65 | 11.72 | 3 | 6.77 | 92 | 19.12 | 1 | 1.19 | | |
| 66 | 11.93 | 2 | 6.47 | 93 | 19.47 | 0 | 1.09 | | |
| 67 | 12.15 | 2 | 6.27 | 94 | 19.83 | 0 | 1.09 | | |
| 68 | 12.37 | 1 | 6.07 | 95 | 20.19 | 1 | 1.09 | | |
| 69 | 12.6 | 1 | 5.97 | 96 | 20.56 | 1 | 1 | | |
| 70 | 12.83 | 2 | 5.87 | 97 | 20.93 | 2 | 0.9 | | |
| 71 | 13.07 | 6 | 5.67 | 98 | 21.32 | 0 | 0.7 | | |
| 72 | 13.31 | 2 | 5.07 | 99 | 21.71 | 0 | 0.7 | | |
| 73 | 13.55 | 2 | 4.88 | 100 | 22.1 | 0 | 0.7 | | |
| 74 | 13.8 | 3 | 4.68 | 101 | 22.51 | 1 | 0.7 | | |
| 75 | 14.05 | 3 | 4.38 | 102 | 22.92 | 1 | 0.6 | | |
| 76 | 14.31 | 6 | 4.08 | 103 | 23.34 | 0 | 0.5 | | |
| 77 | 14.57 | 1 | 3.48 | 104 | 23.77 | 0 | 0.5 | | |
| 78 | 14.83 | 1 | 3.38 | 105 | 24.2 | 2 | 0.5 | | |
| 79 | 15.11 | 4 | 3.28 | 106 | 24.65 | 1 | 0.3 | | |
| 80 | 15.38 | 0 | 2.89 | 107 | 25.1 | 0 | 0.2 | | |
| 81 | 15.66 | 3 | 2.89 | 108 | 25.56 | 0 | 0.2 | | |
| 82 | 15.95 | 1 | 2.59 | 109 | 26.02 | 0 | 0.2 | | |
| 83 | 16.24 | 3 | 2.49 | 110 | 26.5 | 0 | 0.2 | | |
| 84 | 16.54 | 2 | 2.19 | 111 | 26.98 | 0 | 0.2 | | |
| 85 | 16.84 | 3 | 1.99 | 112 | 27.48 | 0 | 0.2 | | |
| 86 | 17.15 | 1 | 1.69 | 113 | 27.98 | 0 | 0.2 | | |
| 87 | 17.46 | 3 | 1.59 | 114 | 28.49 | 1 | 0.2 | | |
| 88 | 17.78 | 0 | 1.29 | 115 | 29.01 | 0 | 0.1 | | |
| 89 | 18.11 | 1 | 1.29 | 116 | 29.55 | 1 | 0.1 | | |
| 90 | 18.44 | 0 | 1.19 | | | | | | |

| GAS PRIME: Benzoic acid/Methanol 900 psi MS#75.dat | | | | | | | |
|--|-------|--------|---------|------|-------|--------|-------|
| Chnl | size | counts | %larger | Chnl | size | counts | |
| 8 | 4.17 | 1 | 100 | 33 | 6.56 | 5 | 41.84 |
| 9 | 4.24 | 1 | 99.58 | 34 | 6.68 | 2 | 39.75 |
| 10 | 4.32 | 4 | 99.16 | 35 | 6.8 | 2 | 38.91 |
| 11 | 4.4 | 2 | 97.49 | 36 | 6.93 | 3 | 38.08 |
| 12 | 4.48 | 5 | 96.65 | 37 | 7.05 | 4 | 36.82 |
| 13 | 4.56 | 6 | 94.56 | 38 | 7.18 | 2 | 35.15 |
| 14 | 4.65 | 9 | 92.05 | 39 | 7.31 | 1 | 34.31 |
| 15 | 4.73 | 6 | 88.28 | 40 | 7.45 | 3 | 33.89 |
| 16 | 4.82 | 15 | 85.77 | 41 | 7.58 | 1 | 32.64 |
| 17 | 4.91 | 5 | 79.5 | 42 | 7.72 | 1 | 32.22 |
| 18 | 5 | 12 | 77.41 | 43 | 7.86 | 2 | 31.8 |
| 19 | 5.09 | 5 | 72.38 | 44 | 8.01 | 2 | 30.96 |
| 20 | 5.18 | 4 | 70.29 | 45 | 8.16 | 3 | 30.13 |
| 21 | 5.28 | 9 | 68.62 | 46 | 8.3 | 4 | 28.87 |
| 22 | 5.37 | 6 | 64.85 | 47 | 8.46 | 2 | 27.2 |
| 23 | 5.47 | 2 | 62.34 | 48 | 8.61 | 4 | 26.36 |
| 24 | 5.57 | 7 | 61.51 | 49 | 8.77 | 1 | 24.69 |
| 25 | 5.67 | 4 | 58.58 | 50 | 8.93 | 1 | 24.27 |
| 26 | 5.78 | 4 | 56.9 | 51 | 9.09 | 2 | 23.85 |
| 27 | 5.88 | 4 | 55.23 | 52 | 9.26 | 3 | 23.01 |
| 28 | 5.99 | 7 | 53.56 | 53 | 9.43 | 2 | 21.76 |
| 29 | 6.1 | 4 | 50.63 | 54 | 9.6 | 1 | 20.92 |
| 30 | 6.21 | 6 | 48.95 | 55 | 9.78 | 3 | 20.5 |
| 31 | 6.33 | 7 | 46.44 | 56 | 9.96 | 2 | 19.25 |
| 32 | 6.44 | 4 | 43.51 | 57 | 10.14 | 2 | 18.41 |
| Chnl | size | counts | %larger | chnl | size | counts | |
| 58 | 10.32 | 3 | 17.57 | 83 | 16.24 | 1 | 7.11 |
| 59 | 10.51 | 0 | 16.32 | 84 | 16.54 | 1 | 6.69 |
| 60 | 10.7 | 4 | 16.32 | 85 | 16.84 | 1 | 6.28 |
| 61 | 10.9 | 0 | 14.64 | 86 | 17.15 | 4 | 5.86 |
| 62 | 11.1 | 0 | 14.64 | 87 | 17.46 | 1 | 4.18 |
| 63 | 11.3 | 1 | 14.64 | 88 | 17.78 | 0 | 3.77 |
| 64 | 11.51 | 1 | 14.23 | 89 | 18.11 | 0 | 3.77 |
| 65 | 11.72 | 0 | 13.81 | 90 | 18.44 | 0 | 3.77 |
| 66 | 11.93 | 2 | 13.81 | 91 | 18.78 | 1 | 3.77 |
| 67 | 12.15 | 2 | 12.97 | 92 | 19.12 | 0 | 3.35 |
| 68 | 12.37 | 0 | 12.13 | 93 | 19.47 | 0 | 3.35 |
| 69 | 12.6 | 1 | 12.13 | 94 | 19.83 | 3 | 3.35 |
| 70 | 12.83 | 1 | 11.72 | 95 | 20.19 | 0 | 2.09 |
| 71 | 13.07 | 0 | 11.3 | 96 | 20.56 | 0 | 2.09 |
| 72 | 13.31 | 1 | 11.3 | 97 | 20.93 | 0 | 2.09 |
| 73 | 13.55 | 2 | 10.88 | 98 | 21.32 | 0 | 2.09 |
| 74 | 13.8 | 0 | 10.04 | 99 | 21.71 | 2 | 2.09 |
| 75 | 14.05 | 1 | 10.04 | 100 | 22.1 | 1 | 1.26 |
| 76 | 14.31 | 1 | 9.62 | 101 | 22.51 | 0 | 0.84 |
| 77 | 14.57 | 1 | 9.21 | 102 | 22.92 | 0 | 0.84 |
| 78 | 14.83 | 2 | 8.79 | 103 | 23.34 | 0 | 0.84 |
| 79 | 15.11 | 0 | 7.95 | 104 | 23.77 | 0 | 0.84 |
| 80 | 15.38 | 1 | 7.95 | 105 | 24.2 | 0 | 0.84 |
| 81 | 15.66 | 0 | 7.53 | 106 | 24.65 | 0 | 0.84 |
| 82 | 15.95 | 1 | 7.53 | 107 | 25.1 | 2 | 0.8 |

| GAS PRIME: Benzoic acid/Methanol (50 psi) MS#80.dat | | | | | | | |
|---|-------|--------|---------|------|-------|--------|---------|
| Chnl | size | counts | %larger | Chnl | size | counts | %larger |
| 8 | 4.17 | 1 | 100 | 32 | 6.44 | 6 | 34.58 |
| 9 | 4.24 | 2 | 99.58 | 33 | 6.56 | 6 | 32.08 |
| 10 | 4.32 | 3 | 98.75 | 34 | 6.68 | 6 | 29.58 |
| 11 | 4.4 | 14 | 97.5 | 35 | 6.8 | 3 | 27.08 |
| 12 | 4.48 | 6 | 91.67 | 36 | 6.93 | 5 | 25.83 |
| 13 | 4.56 | 5 | 89.17 | 37 | 7.05 | 3 | 23.75 |
| 14 | 4.65 | 12 | 87.08 | 38 | 7.18 | 3 | 22.5 |
| 15 | 4.73 | 10 | 82.08 | 39 | 7.31 | 1 | 21.25 |
| 16 | 4.82 | 8 | 77.92 | 40 | 7.45 | 4 | 20.83 |
| 17 | 4.91 | 8 | 74.58 | 41 | 7.58 | 3 | 19.17 |
| 18 | 5 | 9 | 71.25 | 42 | 7.72 | 1 | 17.92 |
| 19 | 5.09 | 9 | 67.5 | 43 | 7.86 | 4 | 17.5 |
| 20 | 5.18 | 9 | 63.75 | 44 | 8.01 | 1 | 15.83 |
| 21 | 5.28 | 8 | 60 | 45 | 8.16 | 2 | 15.42 |
| 22 | 5.37 | 6 | 56.67 | 46 | 8.3 | 2 | 14.58 |
| 23 | 5.47 | 7 | 54.17 | 47 | 8.46 | 1 | 13.75 |
| 24 | 5.57 | 5 | 51.25 | 48 | 8.61 | 3 | 13.33 |
| 25 | 5.67 | 4 | 49.17 | 49 | 8.77 | 2 | 12.08 |
| 26 | 5.78 | 5 | 47.5 | 50 | 8.93 | 2 | 11.25 |
| 27 | 5.88 | 4 | 45.42 | 51 | 9.09 | 2 | 10.42 |
| 28 | 5.99 | 9 | 43.75 | 52 | 9.26 | 1 | 9.58 |
| 29 | 6.1 | 3 | 40 | 53 | 9.43 | 0 | 9.17 |
| 30 | 6.21 | 3 | 38.75 | 54 | 9.6 | 1 | 9.17 |
| 31 | 6.33 | 7 | 37.5 | 55 | 9.78 | 1 | 8.75 |
| Chnl | size | counts | %larger | chnl | size | counts | %larger |
| 56 | 9.96 | 1 | 8.33 | 80 | 15.38 | 0 | 2.08 |
| 57 | 10.14 | 0 | 7.92 | 81 | 15.66 | 0 | 2.08 |
| 58 | 10.32 | 1 | 7.92 | 82 | 15.95 | 0 | 2.08 |
| 59 | 10.51 | 1 | 7.5 | 83 | 16.24 | 0 | 2.08 |
| 60 | 10.7 | 0 | 7.08 | 84 | 16.54 | 0 | 2.08 |
| 61 | 10.9 | 1 | 7.08 | 85 | 16.84 | 0 | 2.08 |
| 62 | 11.1 | 1 | 6.67 | 86 | 17.15 | 0 | 2.08 |
| 63 | 11.3 | 0 | 6.25 | 87 | 17.46 | 0 | 2.08 |
| 64 | 11.51 | 1 | 6.25 | 88 | 17.78 | 0 | 2.08 |
| 65 | 11.72 | 0 | 5.83 | 89 | 18.11 | 0 | 2.08 |
| 66 | 11.93 | 2 | 5.83 | 90 | 18.44 | 0 | 2.08 |
| 67 | 12.15 | 1 | 5 | 91 | 18.78 | 0 | 2.08 |
| 68 | 12.37 | 0 | 4.58 | 92 | 19.12 | 0 | 2.08 |
| 69 | 12.6 | 0 | 4.58 | 93 | 19.47 | 1 | 2.08 |
| 70 | 12.83 | 0 | 4.58 | 94 | 19.83 | 0 | 1.67 |
| 71 | 13.07 | 1 | 4.58 | 95 | 20.19 | 1 | 1.67 |
| 72 | 13.31 | 1 | 4.17 | 96 | 20.56 | 1 | 1.25 |
| 73 | 13.55 | 1 | 3.75 | 97 | 20.93 | 1 | 0.83 |
| 74 | 13.8 | 1 | 3.33 | 98 | 21.32 | 0 | 0.42 |
| 75 | 14.05 | 0 | 2.92 | 99 | 21.71 | 0 | 0.42 |
| 76 | 14.31 | 0 | 2.92 | 100 | 22.1 | 0 | 0.42 |
| 77 | 14.57 | 1 | 2.92 | 101 | 22.51 | 1 | 0.42 |
| 78 | 14.83 | 0 | 2.5 | | | | |
| 79 | 15.11 | 1 | 2.5 | | | | |

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