



# Contamination Knowledge Report:

## BRDF fabric

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### Summary

A sample of BRDF fabric was examined to evaluate the potential scientific impact of potential particle shedding from this material into TAGSAM. BRDF consists of interwoven fiberglass strands 5  $\mu\text{m}$  in diameter coated with Teflon ( $\text{CF}_2$ )<sub>n</sub>. The fiberglass and Teflon have distinctive compositions that will be readily distinguished from asteroidal materials but could pose a potential problem for bulk sample studies. However, of greater concern are chloride salts that occur on the BRDF surface. *Care should be taken to prevent such contamination or to clean the surface of these contaminants.*

### Recommendations

If the BRDF material is used, we are confident that the Sample Analysis team will be able to identify and distinguish these particles. However, the varied contaminants associated with the material requires us to recommend that the material be cleaned before usage on any part of the spacecraft.

### Procedures

A sample of BRDF was received in a plastic bag. A 1 cm square section of BRDF was cut from the main sample, mounted on an SEM stub and coated with 2 nm Pt and examined by SEM/EDX. Secondary electron images and energy dispersive x-ray spectra were obtained from the fibers. EDX spectra were obtained at 15 keV. A separate 1 cm square, uncoated specimen was observed by a digital microscope (2x-200x). At JSC, the sample was handled by tweezers, previous handling history unknown.

### Summary of observations

From optical imaging, extended damages on Teflon coating were observed. (See last page of this report). SEM imaging revealed significant shedding and abrasion of Teflon coating and fiberglass strands. Particles ranging from 1 – 100  $\mu\text{m}$  occurring on the surface of the BRDF fabric include fragments of fiberglass, Teflon, carbonaceous particles, and salts. EDX analysis of these materials revealed the following compositions:

Filaments: Si, Ca, Al & O

Coating: F, C (coating is readily damaged by exposure to the electron beam)

Particles: Si-rich (likely filament fragments)

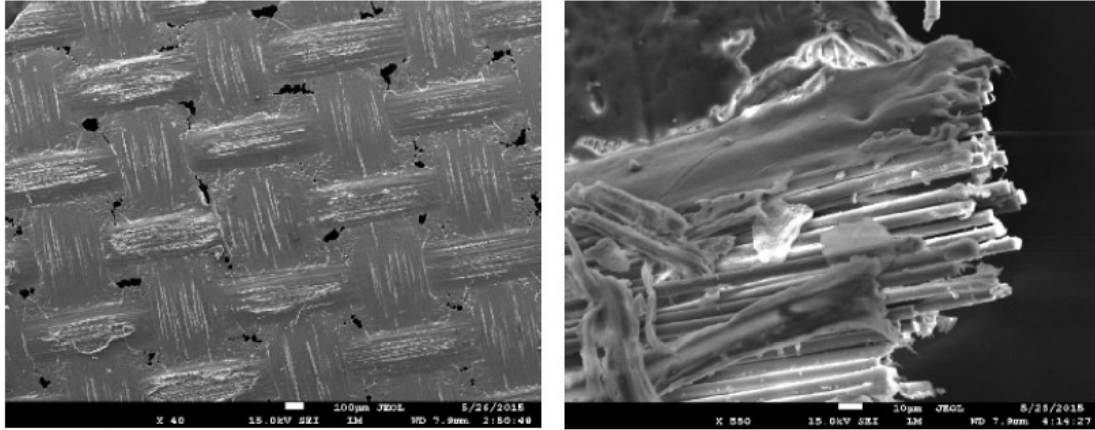
Salts (NaCl, KCl)

C-rich (low F, some contain N and salts; likely organic residue)

Full analytical results are found on the following pages.

5/26/2015

## SEM Imaging and Chemical Analysis of a Fluorinated Hydrocarbon Impregnated Glass Cloth



Sample was coated with 2 nm of Pt  
All spt taken at 15 kV for 20 seconds

### Summary:

SEM / EDX analysis of fabric samples indicates it to be a fluorocarbon (most likely polytetrafluoroethane –  $[\text{CF}_2]_n$ ) impregnated fiberglass cloth. The overall structure can be described as an interwoven square weaved material formed from yarn bundles,  $\sim 300 \mu\text{m}$  in diameter, with each yarn bundle composed of several thousand continuous fiberglass filaments, each  $\sim 5 \mu\text{m}$  in diameter. Coating the exterior surface of the yarn bundles is e-beam sensitive, non-conducting coating, interpreted as fluorocarbon polymer, composed primarily of C and F of approximately equal relative abundance when weighted by the appropriate k-factors. A variety of particulates were identified adhering to the surface of the fabric and ranged in size from  $\sim 1\text{-}100 \mu\text{m}$ .

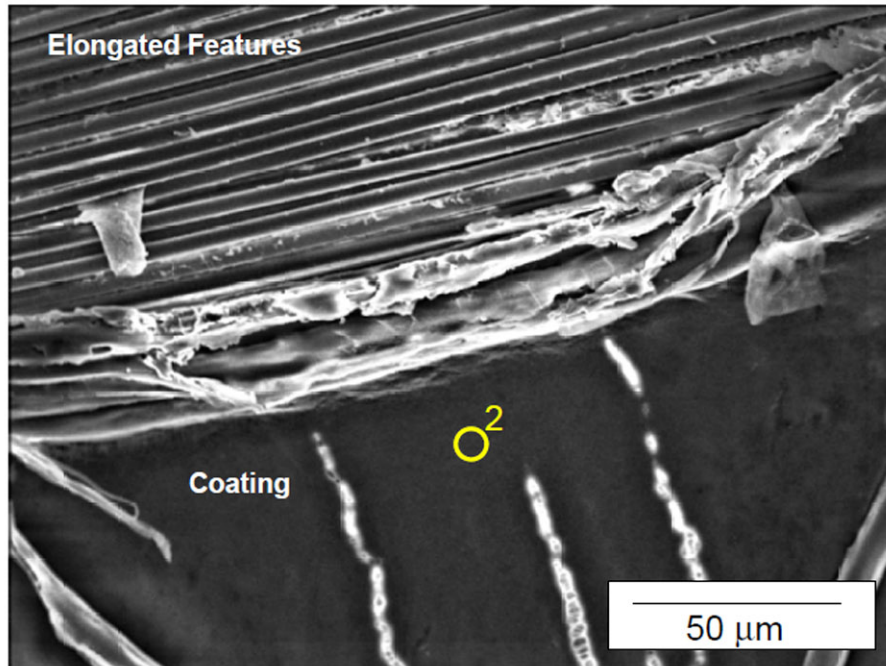
Filaments: Si, Ca, Al & O

Coating: F, C

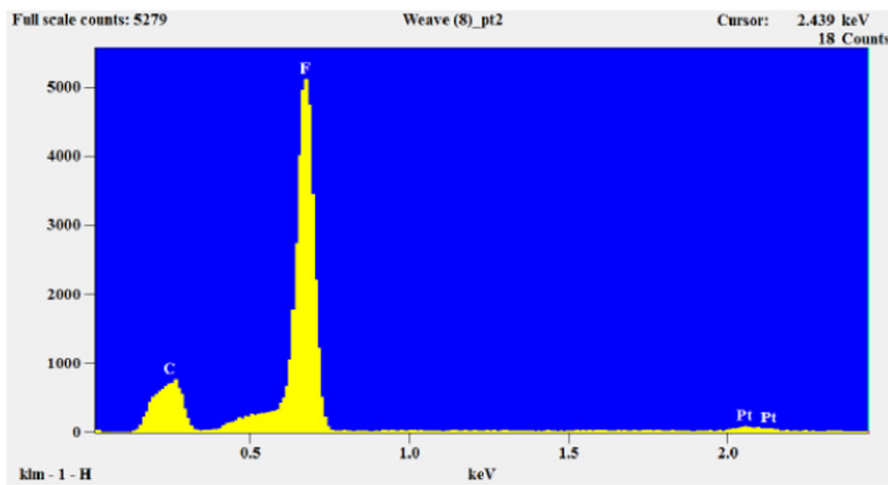
(Note: coating is readily damaged by exposure to the electron beam at 5, 10 and 15 kV)

Particles: Si-rich (likely filament fragments); Salts (NaCl, KCl): C-rich (low F, some contain N and salts; likely organic residue)

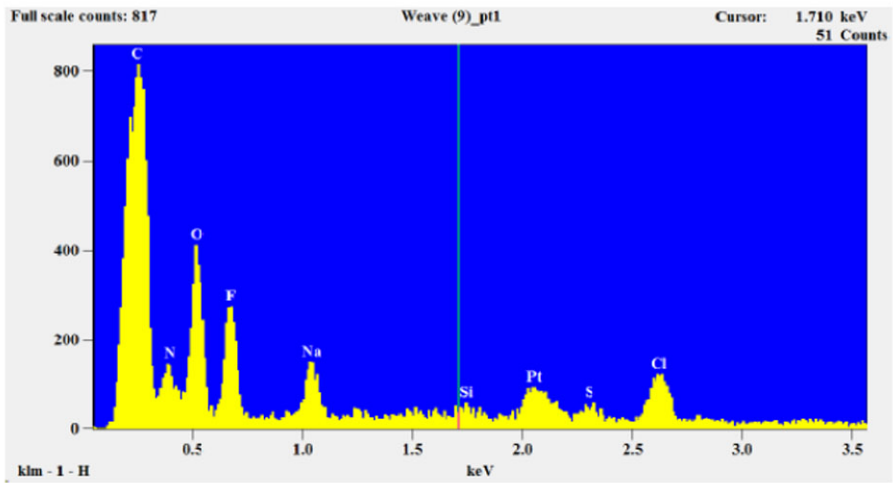
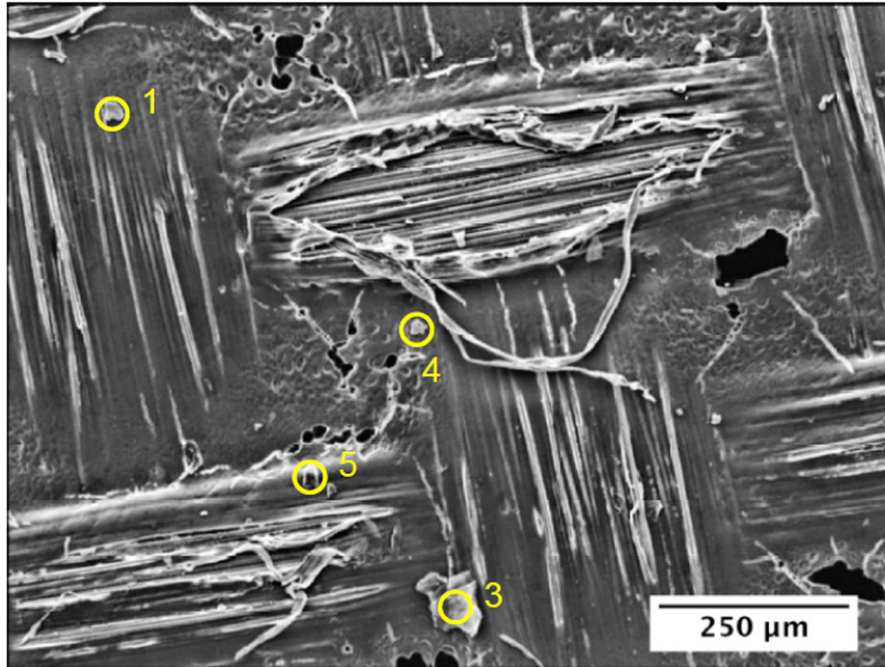
## Weave 8

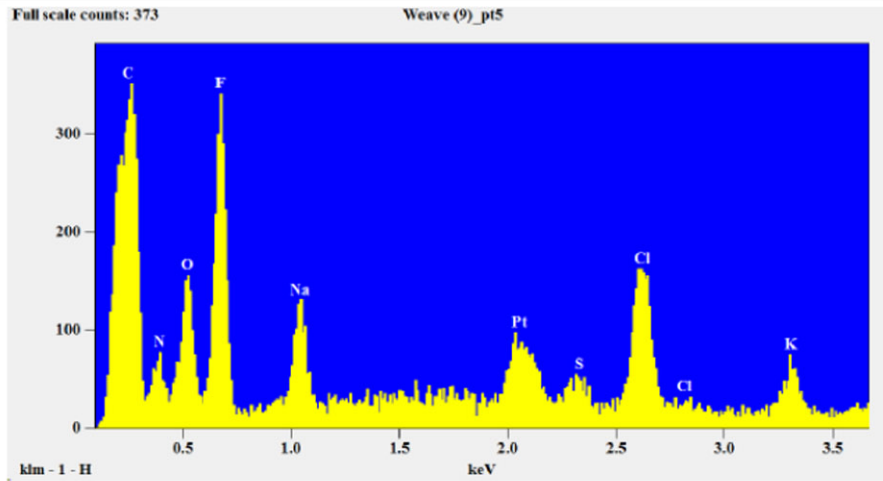
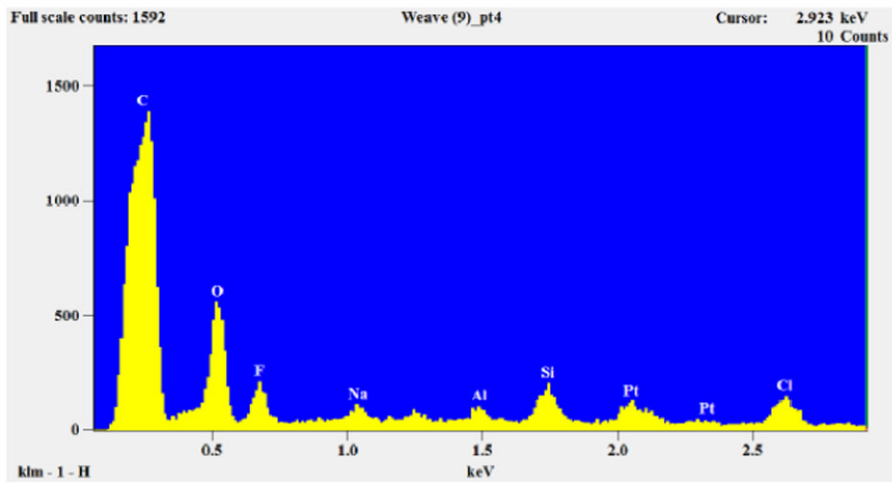
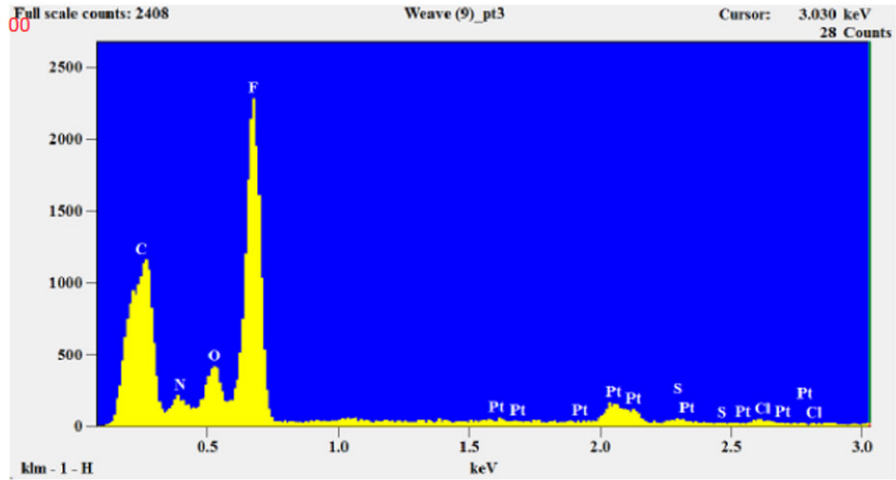


## Spt of coating

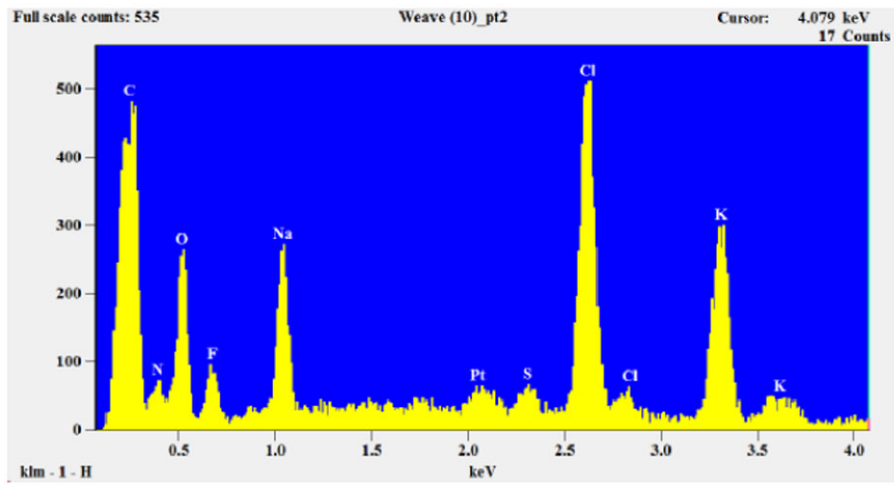
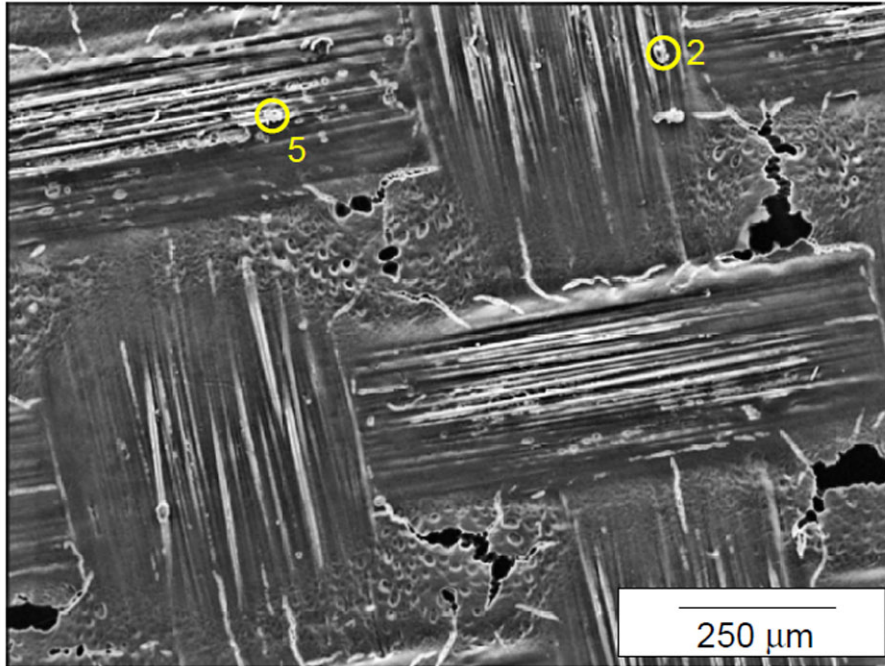


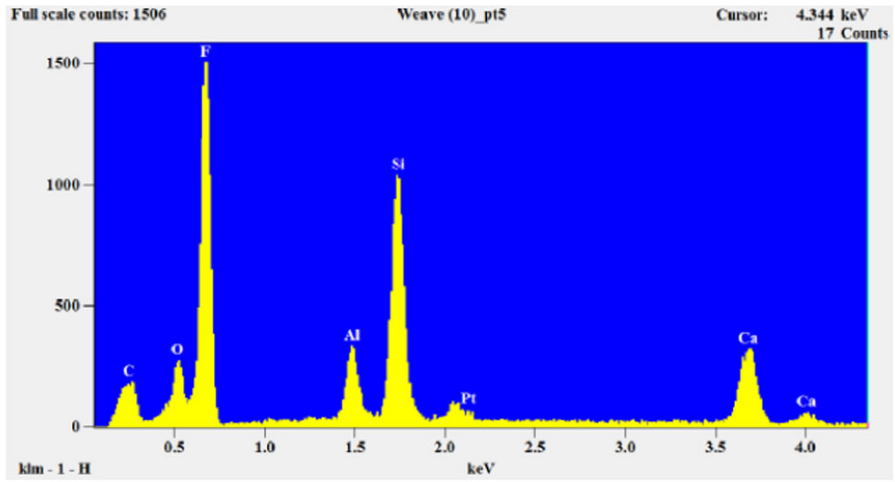
# Weave 9





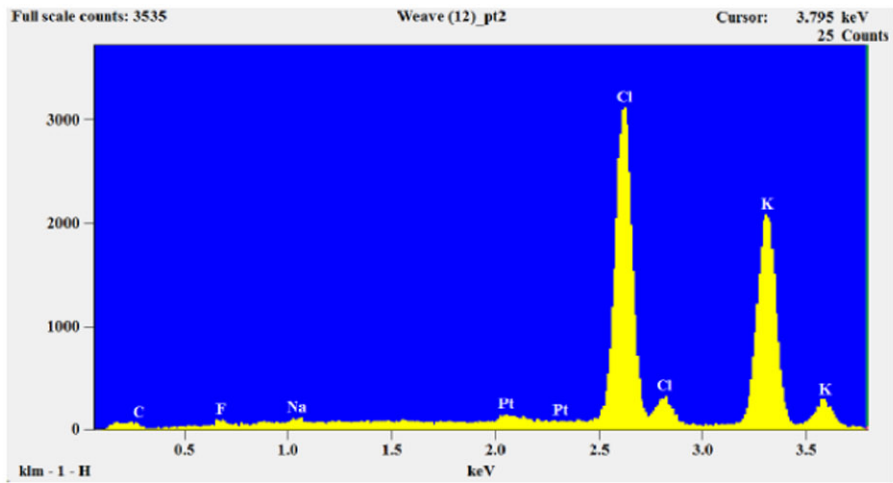
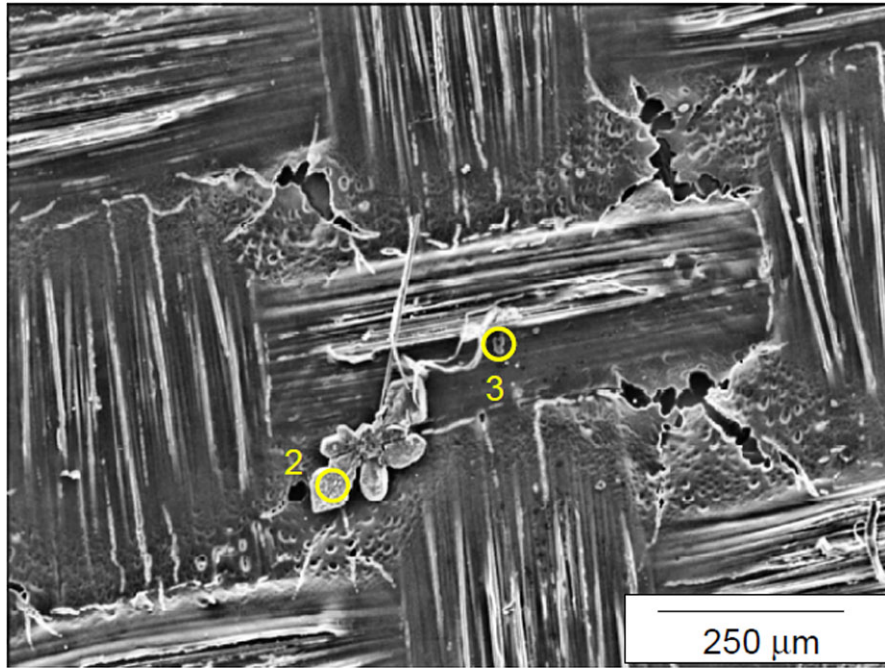
Weave 10

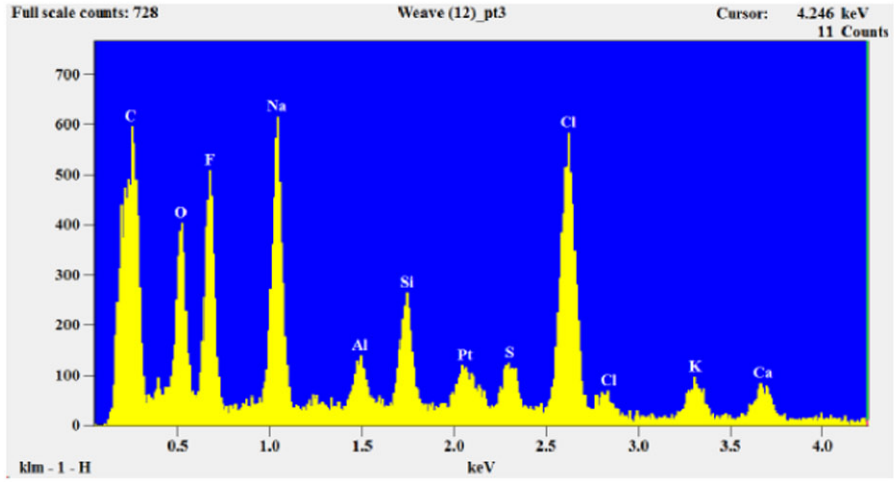




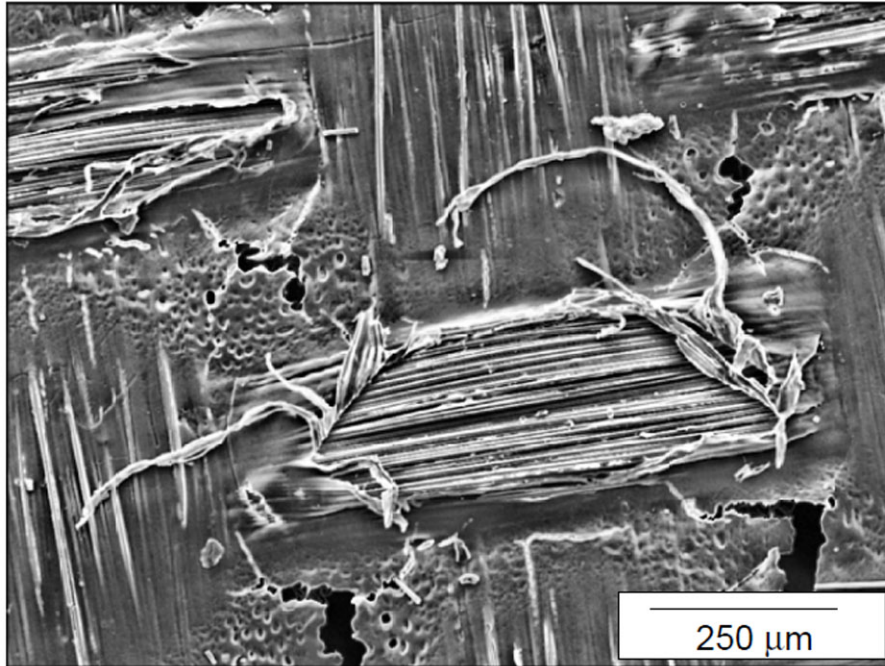
Note: Fragment from filament (see spt Weave 17\_pt2)

Weave 12

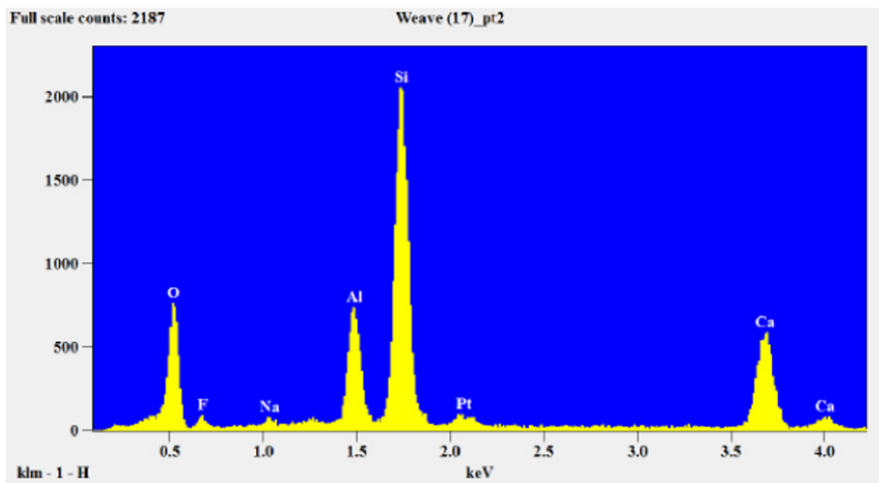
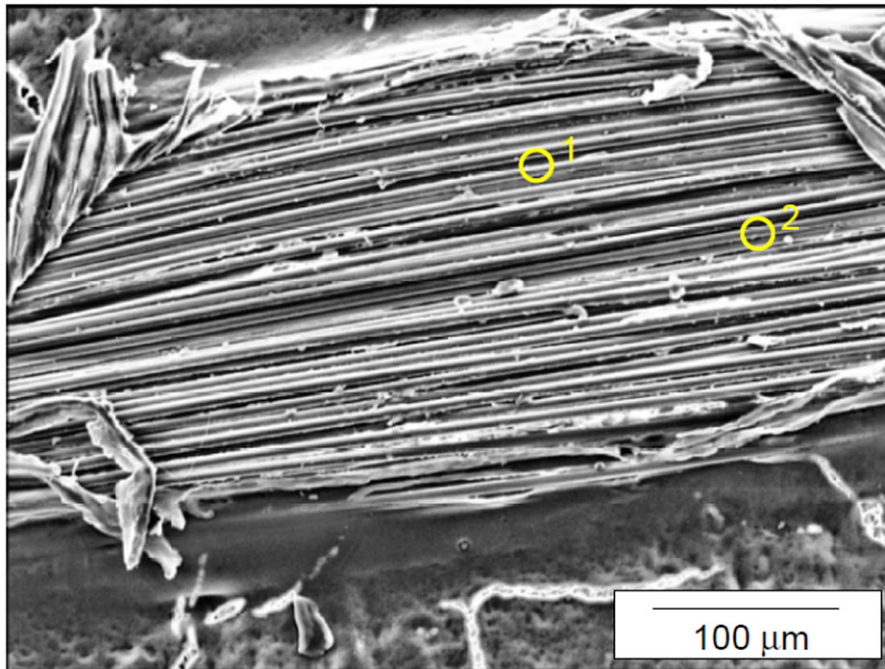




Weave 13  
Abraded coating reveals subsurface, elongated Si-rich filaments



Weave 17



Note: This spt also representative for point 1 shown in image above

