

AGING OF MAGNETIC RECORDING TAPE*



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ABSTRACT

The composition of magnetic recording tape is about 25 wt. % magnetic oxide particles, and 75 wt. % polymeric materials. With the exception of the recording properties of tape which are ascribable to the magnetic oxide particles, almost all of the other properties important to tape, such as aging, storage, tracking, etc., are ascribable to the chemical, physical, and mechanical properties of the polymeric materials.

An experimental study was carried out to investigate the chemical behavior and stability (aging) of magnetic recording tapes exposed to the ambient atmosphere consisting of oxygen, nitrogen, and humidity.

This study showed that the primary mode of environmental degradation of tape results from a chemical reaction between the oxide's polymeric binder and atmospheric moisture, a chemical reaction called "hydrolysis". This reaction results in generation of sticky and gummy products which are infamous for tape sticktion, layer-to-layer adhesion, and increased tape friction and drag on recording heads. Temperature regulates the rates of hydrolysis, increasing the rate with increasing temperature. Oxygen was not found to degrade tapes, but does have an effect on the rates of hydrolysis.

It was further found that tape hydrolysis reverses below a "neutral" relative humidity RH. Above this "neutral" RH, hydrolysis results in tape degradation, whereas below this RH, tape hydrolysis reverses causing restoration and rejuvenation. The ideal storage RH for our archival preservation of magnetic recording tape is at or below the "neutral" RH, which can be different for different tapes.

This paper will discuss the experimental methods and results, and the important conclusions relative to tape storage, restoration, and handling. The aging behavior of magnetic recording tapes in hermetically sealed environments will also be discussed.

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