



A207 Dimensional Stability Concerning Exposures of Polymers to Solvents

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After attending this presentation, attendees will be introduced to a new research study exploring dimensional stability issues that can affect impression evidence comparison and testimony. This research provides insight into the behavior of polymers under a range of situations ranging from casual exposures to extreme workplace conditions.

This presentation will impact the forensic science community by acknowledging that exposure to solvents is known to cause swelling or shrinkage of exposed materials; and by discussing how the immediate impact of this research is limited to those conditions where exposure to solvents are known or suspected, where there is a size difference between a suspect specimen and either of the crime scene markings or a new specimen. This extends to cases where the occupation or activities of a suspect need to be considered or eliminated. While it is not possible to make definitive assertions regarding a particular specimen, this research does provide some basis from which to consider size differences and unusual conditions with an affected specimen.

Exposure to solvents is known to cause swelling or shrinkage of exposed material. This is a topic that can provide necessary background information for anyone giving evidence that pertains to polymers. Dimensional stability has long been investigated by engineers concerned with achieving improvement of specific properties such as resistance to oils or acids.

Industrial interest regarding dimensional stability issues is concerned with the quality control of specific materials and products. Commercially motivated engineering studies are frequently conducted at elevated temperatures that are designed to provide a quick analysis of material designs. This presentation examines results conducted to more closely resemble either casual exposures or actual working conditions.

Dimensional stability issues are not currently included in the literature or methodology of forensic comparison. The effects can be minute, but as with most forensic concerns, small details are no less important than larger counterparts. Current analysis of footwear or tires is conducted almost entirely based on pattern transfer. Dimensional stability (except in extreme cases) cannot be expected to have the same effect with large pattern areas as it does in the comparison of much finer details within a pattern.

The scope of the research presented includes exposure of outsole and tire specimens for varying periods of time, and by different methods, to some common solvents including fuels and water. The methods and conditions of experimentation are noted. Efforts were made to record, limit, or eliminate extraneous influences such as temperature and exposure to UV radiation by the use of selective conditions and control samples.

This particular research was inspired by previous studies which began by examining the stability of specimens immersed in particular solvents including lard, motor oil, and diesel fuel. The addition of casual exposures and controlled comparisons has yielded some interesting results that also suggest the nature of how specimens can behave once the exposures have been removed.

Results of the study will be presented with a caution that in each case, where dimensional stability issues could play a role, specific proof will be required to support findings and opinions. This research builds on previous studies conducted by the author with the intent of providing a starting point for examination of the topic and its relevance to the forensic science community.

Dimensional Stability, Polymers, Solvents