



Engineering Sciences Section – 2004

C2 The Analysis of Darkening Agents in Indoor Environments

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The goal of this presentation is to present to the forensic community information about the microscopical analysis of the causes of darkening and discoloration in indoor environments.

This presentation will impact the forensic community and/or humanity by demonstrating forensic microscopical studies which show the dramatic differences between mold, soot and other contaminants that cause darkening and discoloration in indoor environments, thereby helping to provide the scientific information necessary for judicial decisions.

In recent years, toxic mold contamination has spawned a growing number of complaints and lawsuits from Delaware to California. A landmark June 1, 2003, Travis County, Texas, jury ruling decided that an insurance group must pay more than \$32 million to a Dripping Springs family because of sickening black mold damage. In New York, class certification was denied in an \$8 billion mold case. Concern over mold in indoor environments has clearly become a legal/environmental problem, but the dark discoloration that occurs in residences and workplaces is not always mold. As illustrated by an MVA project, "A Spot Called Ralph," environmental forensic microscopy can provide the scientific data needed to determine the cause of darkening and discoloration. As described in South Carolina's leading newspaper, "A mysterious stain has appeared in the new carpet at the Lexington County's Courthouse. Employees at the courthouse have even given the spot a name - 'Ralph.'" Not only did the stain appear at the courthouse, but after cleaning reappeared and grew in size from about a quarter to several feet in diameter. Testing of the carpet for mold was negative. Because of the unknown nature of the stain, the courthouse offices with the spot were closed as a precaution. A sample of the carpet was delivered to the MVA laboratory for testing. Analysis by polarized light microscopy (PLM) and scanning electron microscopy (SEM) showed that the particles present on the carpet were typical dirt found in offices. A sticky substance holding the particles to the carpet fibers was found to be consistent with corn syrup by Fourier transform infrared (FTIR) spectroscopy. High fructose corn syrup is an ingredient in many soft drinks. The spot called Ralph was probably a combination of typical office dirt and a spilled drink that when not completely cleaned simply spread the sticky substance so the spot appeared to grow.

Black, low temperature combustion soot also causes darkening and discoloration of indoor environments. The difference between mold and soot can be easily seen by microscopy. Some information about the sources of soots can also be determined. Morphology and elemental analysis of soot aggregates by analytical transmission electron microscopy (ATEM) using ASTM D6602 - Standard Practice for Sampling and Testing of Possible Carbon Black Fugitive Emissions or Other Environmental Particulate, or Both, (American Society for Testing and Materials, 2000) can be used to compare with soots from known sources, such as carbon black, fireplace, candles, oil and gas furnaces.

Mold, Soot, Microscopy