B122 Forensic Analysis of Trash Bags: Part I — Microscopical Discrimination of Trash Bags

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After attending this presentation, attendees will understand that trash bags have differing physical features: color, type of closure, surface textures, and heat seals. The bags may also contain different crystalline additives with varying concentrations. Attendees will also understand the role of light microscopy (both reflected light and Polarized Light Microscopy (PLM)) in the forensic analysis of trash bags.

This presentation will impact the forensic science community by informing attendees of a database that was created and includes different brands of trash bags with their descriptions, dimensions, thicknesses, and distinguishing features. This database includes more than 80 different brands of trash bags. Such a database will be useful to forensic examiners as it includes trash bags sold in the United States.

Trash bags can appear as evidence at crime scenes as they can be used to package everything from controlled substances to dead bodies. A frequently asked question is whether a trash bag found at the crime scene can be associated with a roll or box of trash bags found in a suspect's possession. The physical measurements (such as length, width and thickness), optical properties and the additives of each trash bag would be compared. Physical matches of tears, perforations or manufacturing imperfections have proven useful for identifying sequentially manufactured bags.

Eighty-eight trash bag samples were collected, most from the Washington, DC, area and a few were purchased in the Midwest. Boxes or rolls of trash bags were purchased at supermarkets, department stores, and dollar stores. Special emphasis was placed on "store brands." Roughly equal numbers of white "kitchen" trash bags and the large, dark trash and lawn and leaf bags were collected for examination. A majority of trash bag samples were found to have been manufactured in the United States, while a very few were manufactured in China and Canada.

Photomicrographs of the side-edge and bottom-edge heat seals and surface textures were obtained for each bag using a low magnification reflected light stereomicroscope equipped with a 14-megapixel eyepiece digital camera. For transmitted light microscopy, pieces of each trash bag were cut from the side edge. The side seal was retained so that the extrusion direction of the sample could be determined. The pieces of trash bags were cleaned with methanol, left to dry overnight, then permanently mounted on a standard microscope slide with a cover slip for further microscopic examination (brightfield and Polarized Light Microscopy (PLM)). Photomicrographs of the trash bags were obtained under each of the viewing conditions.

The thicknesses of the trash bags varied from 10.1µm to 1,100µm, with majority of the trash bags having a thickness of 22.9µm. The dimensions of the trash bags varied from 55.8cm x 60.9cm to 98.4cm x 114cm, with majority of the trash bags having dimensions of 60.9cm x 68.5cm. The dimensions and thicknesses differentiated the trash bags into 31 and 23 different groups, respectively. PLM provided little differentiation of the trash bags. While crystalline additives in the bags were visible due to their birefringence, the particles were too small to be identified *in situ* by optical crystallography. At most, bags with significant concentrations of additives could be distinguished from those with low concentrations of additives. It was found that the side and bottom heat seals were

very useful for distinguishing different brands of trash bags. The side-edge and bottom-edge heat seals differentiated the trash bags into 37 and 31 different groups, respectively. Such differences presumably reflect differences in the processing of the side and bottom heat seals (e.g., the width of the heated metal strips used to create the seals). The side and bottom heat seals provide better brand discrimination than Fourier transform infrared spectroscopy or X-ray diffractometry.

Trash Bags, Reflected Light Microscopy, Polarized Light Micrscopy