



Engineering Sciences Section - 2016

D16 Forensic Microscopy in a Case of Asbestos-Containing Cigarettes

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After attending this presentation, attendees will better understand how microscopy can be used to study evidence in an unusual civil asbestos case involving vintage (more than 50 years old) cigarettes made with filters containing crocidolite asbestos (Micronite® filter Kent® cigarettes).

This presentation will impact the forensic science community by providing information about handling and analyzing vintage samples to confirm their composition and to determine whether exposures to asbestos could have occurred in the 1950s when the Micronite® filter Kent® cigarettes were commercially available.

During the period of approximately March 1952 through May 1956, the Micronite® filter in Kent® cigarettes used crocidolite asbestos as part of the filtering agent. There was no barrier or secondary filter between the end of this filter and the customer's mouth. It has been estimated that approximately 585 million packs (more than 11 billion cigarettes) were sold in the United States using this design with advertising that emphasized the "health protection" supposedly provided by the filter.

Several packages of the 1952-1956 vintage Kent® cigarettes were obtained in their original sealed packaging and analyzed by Polarized Light Microscopy (PLM), Scanning Electron Microscopy (SEM), and Fourier Transform Infrared microspectrophotometry (micro-FTIR). The outer paper wrapper on the filter consisted of a white paper layer and a tan coating layer. The white paper was part of the continuous white paper that covered the entire cigarette. The inside of the filter consisted of rolled crepe paper with loose fibrous material. Some carbonate particles were also present. Both the white paper and the crepe paper were consistent with chemically processed wood paper fiber. The loose fibrous material consisted of crocidolite, cotton, and cellulose acetate fibers. The composition of the filter in terms of approximate percent by weight of total filter were: outer paper (white paper and tan coating), 16%; crepe paper including carbonate, 62%; crocidolite asbestos, 6%; synthetic fibers (cellulose acetate), 4%; and cotton fibers, 12%. A corporate document described the Micronite® filter as containing cotton, crepe paper, cellulose acetate fibers, and approximately 7% to 25% crocidolite asbestos.¹

The samples were examined for evidence of deterioration. No signs of mold, insect attack, or other deterioration were found. The crepe paper was found to be very flexible and had not become brittle with age.

Arrangements were made to test for particle release from regular and king-size Micronite® filter Kent® cigarettes using a standard smoking machine following generally accepted International Organization for Standardization (ISO) and Canadian smoke testing protocols.^{2,3} A non-asbestos Kent® cigarette (later vintage) was smoked as a control. The smoke was collected on glass fiber Cambridge® filters. The filters were prepared for Transmission Electron Microscopy (TEM) using an acid/base digestion of the glass filter fiber that does not affect amphibole crocidolite fibers.⁴ The samples were analyzed using American Society for Testing and Materials (ASTM) Standard Method D6281 for asbestos.⁵ Crocidolite asbestos fibers were found to be released in the smoke of both regular and king-size Kent® Micronite® filter cigarettes.

Reference(s):

1. Defendant Lorillard Tobacco Company's Responses to Plaintiffs' Standard Interrogatories (First Set) In the case of *Joe Habberthur v. Advocate Mines, LTD, et al.*, in Superior Court of the State of California, County of Los Angeles, Case No. BC 433318.
2. International Organization for Standardization Routine analytical cigarette□smoking machine—definitions and standard conditions. ISO Standard 3308, 4th ed. ISO 2000.
3. *Determination of "Tar," Nicotine and Carbon Monoxide in Mainstream Tobacco Smoke*, Health Canada Method T-115, 1999.
4. Millette J.R., Harmon A., Few P., Turner Jr. W.L., Boltin W.R. Analysis of amphibole asbestos in chrysotile-containing ores and a manufactured asbestos product. *Microscope*, 57(1):19-22, 2009.
5. American Society for Testing and Materials, ASTM D6281-09, *Standard Test Method for Airborne Asbestos Concentration in Ambient and Indoor Atmospheres as Determined by Transmission Electron Microscopy Direct Transfer*, 2009.

Microscopy, Kent® Cigarettes, Asbestos

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