B127 Evaluation of the Effectiveness of Nylon Bags as Packaging for Fire Debris

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After attending this presentation, attendees will have been presented with the limitations associated with the use of nylon bags as packaging for fire debris samples with respect to the possible loss or crosstransfer of ignitable liquid vapors.

This study confirmed that nylon bags are suitable packaging for fire debris samples if properly sealed. Heat-sealing, although the most effective at retaining ignitable liquid vapors, is not always practical in the field and is not easily reproducible. Folding the opening of the nylon bag three times and then duct taping the fold is a satisfactory alternative that limits the loss of ignitable liquid vapors. The swan neck seal proved to be least effective, however, this study shows that no cross transfer occurred between nylon bags sealed in this way when stored for an extended period of time. Nonetheless, efforts to minimize the possibility of cross-contamination, such as separating samples from different sources, are recommended.

A proper container for packaging of fire debris samples must be effective at retaining ignitable liquid vapors. Glass Mason jars, metal cans, and nylon bags are the accepted packaging. At this laboratory the preferred packaging is glass Mason jars; nylon bags are recommended as an alternative when the fire debris is too large to fit the preferred packaging. A study was undertaken to explore the effectiveness of Grand River® nylon bags with a swan neck seal, as typically received at this laboratory. The effectiveness of these bags, different sealing techniques, and the possibility of cross-transfer of ignitable liquid vapors between adjacent bags were evaluated. Analysis involved dynamic headspace sampling using tubes packed with Tenax® adsorbent and gas chromatography with flame ionization detection (GC-FID) or gas chromatography-mass spectrometry (GC-MS).

An experiment was designed to evaluate the loss of several classes of ignitable liquid vapors. A solvent mixture, gasoline, kerosene, and light, medium and heavy petroleum distillates were used. Paper towels spiked with 50µL of an ignitable liquid were packaged in nylon bags with a swan neck seal and subsequently placed into a clean glass Mason jar, which was immediately capped. Room temperature analysis of the glass Mason jar headspace was conducted to determine whether any vapors had escaped from the nylon bags. The results indicated loss of ignitable liquid vapors regardless of product class. Further work was undertaken to determine whether the loss occurred through the walls of the nylon bags or through the seal.

The effectiveness of different sealing techniques was evaluated as above using paper towels spiked with 50µL of gasoline. The sealing techniques tested were a swan neck seal, a triple fold sealed with duct tape, a single heat seal and a double heat seal. Single and double heat seals were the most effective at retaining ignitable liquid vapors, as gasoline was not identified in the headspace of the glass Mason jars. Low levels of incomplete gasoline patterns, which would not meet this laboratory's criteria for identification of gasoline, were observed from nylon bags that were sealed with duct tape. Identifiable gasoline patterns were seen in the results from the nylon bags sealed with a swan neck seal.

The effect of double bagging with a swan neck seal was also investigated using gasoline. The results indicated no significant advantage, with respect to retaining ignitable liquid vapors, over a single bag with a swan neck seal.

The possibility of cross transfer of ignitable liquids between nylon bags with a swan neck seal was explored. Two nylon bags were placed together in a cardboard box: one nylon bag contained paper towels spiked with 1mL of an ignitable liquid; and, the other contained clean paper towels. As in the first part of the study, a solvent mixture, gasoline, kerosene, and light, medium and heavy petroleum distillates were used. The cardboard box was sealed with tape and stored for approximately five months. No ignitable liquid vapors were identified in the box or the adjacent nylon bag, despite the presence of visible liquid or strong positive results in the spiked nylon bag.

This study confirmed that nylon bags are suitable packaging for fire debris samples if properly sealed. Heat-sealing, although the most effective at retaining ignitable liquid vapors, is not always practical in the field and is not easily reproducible. Folding the opening of the nylon bag three times and then duct taping the fold is a satisfactory alternative that limits the loss of ignitable liquid vapors. The swan neck seal proved to be least effective, however, this study shows that no cross transfer occurred between nylon bags sealed in this way when stored for an extended period of time. Nonetheless, efforts to minimize the possibility of cross contamination, such as separating samples from different sources, are recommended.

Fire Debris Analysis, Packaging, Nylon Bags

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