



Evaluation of Wildland Fire Chemicals

STANDARD TEST PROCEDURES

EFFECT ON NON-METALLIC MATERIALS

Summary: Non-metallic materials may be adversely impacted by exposure to the products used in fire management operations. There are many materials that may be used in the handling and delivery of these products. Several representative materials have been selected for use in the evaluation of the fire chemical products. These materials are exposed under specific, prescribed conditions and the resulting changes in hardness and volume of the non-metallic materials determined.

Equipment:

Quart jars

Non-metallic samples: Test pieces, approximately 0.5" x 3" x 1/8", made of the materials listed below shall be subjected to the testing described in this procedure.

<u>Non-metallic Material</u>	<u>Material Specification</u>	<u>Durometer Type</u>
Chloroprene rubber	AMS 3208M	A2
PVC Plastic, Flexible	MIL A-A-55859A	A2
Sealant	AMS S-8802	A2
Sealant	MIL PRF-81733D	A2
Fiberglass/Epoxy Resin	AMS C-9084	D
High-Density Polyethylene	ASTM D-4976	D
Low-Density Polyethylene	ASTM D-4976	D
Flexible Cross-Linked Polyolefin	AMS DTL-23053/5	D

Hardness: Durometers, Type A2 and D

Volume: Calipers or a small graduated cylinder that will completely contain the test pieces, 25 mL is usually sufficient

Method:

1. Using the durometer specified in the table, determine the hardness of each non-metallic sample.
 - a. Place the sample on a flat surface.
 - b. Place the appropriate durometer in a vertical position with the foot flat on the test sample.
 - c. Apply the presser foot to the sample with a firm, smooth downward action.
 - d. The durometer should not roll or move laterally during this action.
 - e. Record the durometer scale and the reading from the dial.
 - f. Repeat the process to obtain 3 values.
 - g. Use the average hardness to determine the difference in step 4.
2. Determine the volume of the non-metallic sample.
 - a. If the test material is a firm, regular rectangle, the length, width, and height can be measured with calipers and the volume calculated.

- b. When the test material is an irregular shape or too soft for accurate measurement with calipers, use the fluid displacement method.
 - c. Use the smallest graduated cylinder that will contain the test sample within the graduated portion of the cylinder.
 - d. Place the test sample in the graduated cylinder and fill with water to the first major graduation above the test sample. You may have to hold the test sample under the water with the tip of a paper clip or other small item.
 - e. Record the volume of the water and test sample.
 - f. Remove the test sample, retaining as much of the water as possible in the cylinder.
 - g. Record the volume of the water.
 - h. Calculate the volume of the test sample by subtracting the first value from the second.
 - i. Dry the test sample with a lint-free tissue.
 - j. Repeat the measurement, starting by adding water to the next major graduation in the cylinder, adding the test sample and noting the increase in volume of the water.
 - k. Repeat for a total of 4 volume determinations
 - l. Use the average volume to calculate the difference in volume in step 4.
3. Expose the non-metallic specimen in the test product.
 - a. Put 800-1000 ml of the test product in a separate glass quart jar for each non-metallic material.
 - b. Suspend 3 pieces of the same non-metallic material in a single jar so that the pieces are not touching.
 - c. Expose the test materials for 20 cycles at room temperature, each consisting of total immersion at night and on weekends and suspension in the air during the work day.
 - d. Do not wipe the residue from the non-metallic pieces during the test period.
 - e. At the end of the test period, rinse each specimen, and wipe with a disposable, lint free tissue.
 4. Determine the effects of the exposure.
 - a. Determine the hardness and volume of the test piece, as described in steps 1 and 2, on the same day that the exposure ends.
 - b. Calculate the change in volume by subtracting the final volume from the initial volume.
 - c. Calculate the percent change in hardness as shown.

$$\text{Percent Change} = \frac{X_{\text{initial}} - X_{\text{final}}}{X_{\text{initial}}} \times 100$$
 - d. If either measurement exceeds the allowable variation, wait 24 hours and repeat the measurements and calculations.

Reference:

American Society for Testing and Materials (ASTM). Standard Test Method for Rubber Property- Durometer Hardness; D2240-2005.