

MIL-W- 12598(Ord)
31 March 1953

MILITARY SPECIFICATION

WAX, MICROCRYSTALLINE, IMPREGNATING

1. SCOPE

1.1 This specification covers one grade of high-melting-point microcrystalline wax suitable for impregnating porous metal parts.

2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications and standard, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

- | | | |
|-----------|---|---|
| SS-R-406 | - | Road and Paving-Materials; Methods for Sampling and Testing. |
| VV-L-791 | - | Lubricants, Liquid-Fuels, and Related Products; Methods of Inspection, Sampling, and Testing. |
| LLL-B-631 | - | Boxes; Fiber, Corrugated (For Domestic Shipment). |
| LLL-B-636 | - | Boxes; Fiber, Solid (For Domestic Shipment). |

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| JAN-D-111 | - | Drums, Fiberboard (Overseas Type). |
| JAN-P-122 | - | Packaging and Packing for Overseas Shipment - Barrels, Slack. |
| JAN-P-134 | - | Packaging and Packing for Overseas Shipment - Kegs, Slack. |

STANDARD

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- | | | |
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| MIL-STD-129 | - | Marking of Shipments. |
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(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer).

3. REQUIREMENTS

3.1 Material. - The microcrystalline wax shall be a chemically inert, non-hygroscopic material consisting essentially of hydrocarbon compounds.

3.2 Chemical and physical properties. - The microcrystalline wax shall conform to the chemical and physical requirements shown in table I, when tested in accordance with the corresponding test methods specified in section 4.

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Table I - Chemical and physical properties of the wax.

Property	Requirement	Test paragraph
Melting point, °F, minimum	190	4.4.1
Viscosity, Saybolt Universal, at 210°F, seconds, minimum ¹	80	4.4.1
Flash point, °F, minimum	500	4.4.1
Fire point, °F, minimum	550	4.4.1
Specific gravity, at 60°F, °API, minimum	34	4.4.1
Needle penetration, units	2 to 8	4.4.1
Acid number, maximum	0.05	4.4.1
Saponification number, maximum	0.2	4.4.1
Corrosiveness	No pitting or discoloration of the copper strips	4.4.1
Water absorption, percent, maximum	0.2	4.4.2
Loss on heating, percent, maximum	1.0	4.4.3
Capillary rise index, minimum	24.0	4.4.4
Adhesion to metal, at 0°F	No flaking	4.4.5
Stability	No separation and no sludge formation	4.4.6

¹Not required if melting point exceeds 200°F.

3.3 Workmanship. - The microcrystalline wax shall be manufactured in accordance with high-grade commercial practices for this type of material.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Lot. - A lot shall consist of all the wax produced in a manufacturer's batch.

4.2 Sampling. - A representative sample of the wax in the lot shall be obtained by selecting 1 percent, but not less than 3 containers, of the containers comprised in the lot. If there are less than 4 containers in the lot, all the containers shall be sampled. An equal amount of wax shall be removed from each selected container to make the total weight of the lot sample approximately 5 pounds. The individual samples shall be placed together in a suitable clean heat-resistant container and heated until completely melted. The molten material shall be stirred until it becomes homogeneously blended. The mixture shall be poured into a clean mold and allowed to solidify. The blended material shall be the source of all the test samples required for performing the tests specified in section 4.

4.3 Inspection. - Unless otherwise specified, inspection shall be at the place of delivery.

4.4 Tests.

4.4.1 Test methods. - Conformance of the wax with the specified requirements for those properties listed below, shall be determined in accordance

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with the applicable test methods of Specification VV-L-791, or SS-R-406:

Property	VV-L-791 Method No.	SS-R-406 Method No.
Melting point ¹	140.1	-----
Viscosity ²	30.5	-----
Flash point	110.3	-----
Fire point	110.3	-----
Specific gravity ³	-----	209.2
Needle penetration	-----	214.0
Acid number	410.6	-----
Saponification number	540.3	-----
Corrosiveness	530.3	-----

¹ A partial immersion thermometer with a range of 0 to 300°F, conforming to method 950.1 of Specification VV-L-791, shall be used in determining the melting point.

² Convert the kinematic viscosity obtained by this method to Saybolt Universal viscosity in accordance with Method 910.1 of Specification VV-L-791, to determine compliance with the requirement for viscosity specified in table I.

³ The specific gravity shall be determined by the displacement procedure of the specified method.

4.4.2 Water absorption. - A sufficient quantity of the wax shall be melted and poured into a clean mold measuring approximately 2 by 1 by 1 inches. The sample shall be allowed to solidify, then removed from the mold, and cooled in a desiccator for at least 6 hours. (Note: A block that shows any cracks after cooling shall not be used in the test.) The dried wax block shall then be accurately weighed, and immersed for 24 hours in a liter of distilled water maintained at $77 \pm 2^\circ\text{F}$. The wax block shall then be removed from the water, wiped dry of surface water with a soft rag, and weighed accurately. The gain in weight of the block shall be calculated to percentage of water absorption.

4.4.3 Loss on heating. - A sample of approximately 200 grams of the wax shall be weighed accurately in a tared clean porcelain dish, approximately 4 inches in diameter, so that the exposed surface of the molten wax shall have an area of 12 to 15 square inches. The dish containing the wax shall be placed for 4 hours in a forced-draft oven maintained at $300 \pm 5^\circ\text{F}$, after which it shall be cooled in a desiccator, and weighed. Calculate the percent loss in weight of the wax due to heating.

4.4.4 Capillary rise index.

4.4.4.1 Apparatus.

4.4.4.1.1 Dish. - Bottom half of a standard pyrex petri dish, approximately 100 by 20 mm.

4.4.4.1.2 Ruler. - Metal ruler graduated in millimeters.

4.4.4.1.3 Capillary tubing. - Glass capillary tubing of uniform circular cross-section.

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4.4.4.1.4 Microscope. - Microscope with calibrated eyepiece, or a micrometer microscope.

4.4.4.2 Procedure.

4.4.4.2.1 The radius of the capillary tube shall be determined as follows:

A small blotter shall be dipped in ink and, while the blotter is still wet, one end of the capillary tube shall be pressed against it. The imprint of the inked end of the capillary tube shall then be transferred to a piece of white paper. The diameter of the capillary in the imprint shall be measured with a microscope having a calibrated eyepiece, or with a micrometer microscope. The diameter of both ends of the capillary shall be determined in this manner. If the diameter of the 2 ends of the capillary differ by more than 5 percent of each other, the capillary tube shall be discarded. One-fourth of the sum of the 2 diameters shall be considered as the radius of the capillary tube for purposes of calculating the rise index (see below).

4.4.4.2.2 A sufficient quantity of wax shall be placed in the petri dish so that the dish is half full when the wax is melted. The Petri dish and its contents shall then be placed in an oven maintained at a temperature 150F higher than the melting point of the wax, until the wax is completely melted. The capillary tube shall be attached to the ruler by any suitable means, so that one of its ends is near the low end of the ruler. The ruler and the capillary tube shall then be suspended in the oven, vertical to the surface of the wax, in such a manner that the end of both the ruler and the tube are well below the surface of the wax. The assembly shall be allowed to remain in the oven for at least 1/2-hour in order to establish temperature equilibrium. Readings on the ruler shall be made at the surface of the wax in the Petri dish, and at the meniscus of the wax column in the capillary tube. The difference between these 2 readings shall constitute the height of rise of the wax. The capillary rise index shall be calculated as follows:

$$I = \frac{Rg}{2} \left(h / \frac{R}{3} \right)$$

where:

- I = capillary rise index.
- R = radius of the capillary, in centimeters.
- g = acceleration due to gravity in area where test is conducted, in cms/sec^2
- h = height of rise of wax in the capillary, in centimeters.

The average of 3 such determinations shall be considered as the capillary rise index of the wax.

4.4.5 Adhesion to metal of 0°F. - A coating of the wax, not more than 0.003-inch in thickness, shall be applied to each of 3 cleaned 30-gauge,

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low-carbon-steel test panels, by first heating the panels for at least 5 minutes in an oven maintained at $250 \pm 5^{\circ}\text{F}$, and then immersing the panels, while at that temperature, in molten wax also maintained $250 \pm 5^{\circ}\text{F}$. The panels shall be withdrawn from the wax, and tilted to one side to allow the excess wax to drip off one corner of the panel. The coated panels shall be set aside to cool to room temperature, and then placed for 2 hours in a refrigerator maintained at 0°F . The panels shall then be removed from the refrigerator and bent through 180° around a 1/2-inch mandrel which has also been refrigerated at 0°F . The panel surface in the bent area shall be examined for evidence of flaking of the wax.

4.4.6 Stability. - A 200-gram sample of the wax shall be placed in a 400-ml. heat-resistant glass beaker, and heated for 72 hours in an oven maintained at $210 \pm 5^{\circ}\text{F}$. At the end of the heating period the wax shall be removed and examined visually for evidence of separation of its components, and for formation of sludge. (Note: Examination may be facilitated by pouring the molten wax into a second beaker and examining the bottom and sides of the first beaker for separated material and for sludge.)

4.5 Rejection and resubmission. - If the test sample fails to meet the specified requirements the lot shall be rejected. The contractor, at no expense to the Government, shall have the option to have an analysis made of each container in the lot, remove the nonconforming material, and resubmit the remaining portion of the lot for acceptance testing. If any specimen taken from the resubmitted portion of the lot fails to meet the specified requirements the lot shall be finally rejected.

5. PREPARATION FOR DELIVERY

5.1 Packing.

5.1.1 Unless otherwise specified, the microcrystalline wax shall be packed as slabs, of 5 to 25 pounds each, in suitable style corrugated or solid fiberboarded boxes conforming to Specification LIII-B-631 or LIII-B-636, respectively, having a minimum Mullen test of 275 pounds. The slabs shall be separated from each other by a sheet of dry waxed kraft or sulfite paper of not less than 30-pound basis weight. The bottom flaps of the boxes shall be sealed with a suitable adhesive, or closed by metal stitching. The top flaps shall be sealed with a suitable adhesive, or by metal stitching or taping them, or by any combination thereof. Kraft gummed tape, not less than 2-1/2-inches in width, and of 60-pound minimum basis weight, shall be used when the boxes are taped.

5.1.2 When so specified the wax shall be furnished in bulk form in fiber drums, slack barrels, or slack kegs.

5.1.2.1 The drums shall conform to Specification JAN-D-111, except that the drums will not be required to meet the wet tests, and the dry compression load may be reduced to 750 pounds. The gross weight of the packed drum shall not exceed 120 pounds.

5.1.2.2 The slack barrels shall conform to Specification JAN-P-122. The gross weight of the packed barrel shall not exceed 150 pounds.

5.1.2.3 The slack kegs shall conform to Specification JAN-P-134. The gross weight of the packed keg shall not exceed 150 pounds.

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5.2 Marking. - In addition to any special marking required by the contract or order, each container shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Intended Use. - The microcrystalline wax is intended for impregnating sintered iron components, such as rotating bands, and for other ordnance uses.

6.2 Ordering data. - Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. The type of container required when the wax is furnished in bulk form (see 5.1.2).

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished or in any way supplied the said drawings, specifications, or other data is not to be regarded, by implication or otherwise, as in any manner licensing the holder or any other person or corporation or conveying any rights of permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

Army-Ordnance Corps

Other interest:

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