

**AEROSPACE
MATERIAL
SPECIFICATION**

Submitted for recognition as an American National Standard

SAE AMS 1731A

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Superseding AMS 1731

UREA COMPOUND, POWDER

1. SCOPE:

1.1 Form: This specification covers a urea compound in the form of a powder.

1.2 Application: Primarily for use in mixing with sand for deicing airport ramps, walkways, and other ground surfaces, for manufacturing of shotted urea, and as a fire retardant in aerospace materials.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices shall apply. The applicable issue of other documents shall be as specified in AMS 2350 except that the latest issue of APHA and AOAC publications in effect on date of invitation to bid or request for proposal shall apply.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

AMS 2825 - Material Safety Data Sheets

AMS 4049 - Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad 7075; -T6 Sheet, -T651 Plate)

2.1.2 Aerospace Recommended Practices:

ARP 1511 - Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals

ARP 1512 - Corrosion of Aluminum Alloys by Aircraft Maintenance Chemicals, Sandwich Test

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2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

- ASTM D1119 - Ash Content of Engine Antifreezes, Antirusts, and Coolants
- ASTM D1193 - Reagent Water
- ASTM D1353 - Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products
- ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM E324 - Relative Initial and Final Melting Points and the Melting Range of Organic Chemicals
- ASTM F483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
- ASTM F484 - Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
- ASTM F502 - Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
- ASTM F503 - Preparing Aircraft Cleaning Compounds, Liquid Type, for Storage Stability Testing
- ASTM F519 - Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-P-83310 - Plastic Sheet, Polycarbonate, Transparent

2.3.2 Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

2.4 APHA Publications: Available from American Public Health Association, 1015 Eighteenth Street, N.W., Washington, DC 20036.

APHA Standard Methods for Examination of Water and Wastewater

2.5 AOAC Publications: Available from Association of Official Agricultural Chemists, P.O. Box 540, Benjamin Franklin Station, Washington, DC 20004.

Official Methods of Analysis of the Association of Official Agricultural Chemists.

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall be a uniform, white, crystalline urea conforming to the following requirements, determined in accordance with specified test methods from APHA Standard Methods for Examination of Water and Wastewater:

		Method No.
Free Ammonia (NH ₃), max	300 ppm	132
Chlorides	None	112A
Iron, max	2 ppm	124A, B, or C
Sulfides	None	157
Sulfates (SO ₄)	None	156C
Nitrogen, min	46%	135

3.1.1 Moisture: Shall be not more than 0.40%, determined in accordance with ASTM D1568.

3.1.2 Biuret: Shall be not more than 2.1%, determined in accordance with Official Methods of the Association of Official Agricultural Chemists, Chapter 2, excluding ion exchange column. Prepare a standard curve using 5 mL, and 25 mL quantities and using a 2-g sample.

3.1.3 Ash: Shall be not higher than 0.003% by weight, determined in accordance with ASTM D1119.

3.2 Properties: Urea compound shall conform to the following requirements; tests shall be performed in accordance with specified test methods on the product supplied in concentrated form and at use dilution as specified:

3.2.1 On Concentrated Urea Compound:

3.2.1.1 Temperature Stability: Urea compound shall show no chemical or physical deterioration, including evidence of discoloration or other change denoting loss of stability, after being exposed for 120 hr \pm 1 at 2°C \pm 3 (35°F \pm 5).

3.2.1.2 Nonvolatile Matter: Shall be determined in accordance with ASTM D1353 and the results reported.

3.2.1.3 Melting Point: Shall be not lower than 132°C (270°F) and not higher than 133°C (272°F), determined in accordance with ASTM E324.

3.2.1.4 Storage Stability: Urea compound shall be stable in storage for not less than 12 months at room temperature and shall not deliquesce or otherwise deteriorate when stored in shipping container or use package, determined in accordance with ASTM F503.

3.2.2 On Diluted Urea Compound: Shall be as follows, determined on a 25% \emptyset ASTM D1193, Type IV, water solution of the urea:

3.2.2.1 Residue: Urea solution shall leave no residue or stains on aluminum alloy, determined in accordance with 3.2.2.1.1.

3.2.2.1.1 Two 2 x 6 in. (50 x 150 mm) panels of AMS 4049 aluminum alloy shall be cleaned with acetone and immersed in the urea solution so as to cover approximately one-half of the panel. After the urea solution has been applied, the panels shall be placed at 45 deg + 5 from the horizontal in an oven maintained at 38°C + 1 (100°F + 2) for 30 min. + 1, removed from the oven, rinsed with room temperature methyl ethyl ketone, allowed to dry, and the treated and untreated areas of the panels visually examined and compared for the presence of residue and stains.

3.2.2.2 Corrosion of Metal Surfaces:

3.2.2.2.1 Sandwich Corrosion: Two 2 x 6 in. (50 x 150 mm) panels of AMS 4049 aluminum alloy, after test, shall show a rating not worse than 1, determined in accordance with ARP 1512.

3.2.2.2.2 Total Immersion Corrosion: Urea solution shall neither show evidence of pitting or corrosion of the panels nor cause a weight change of any test panel of AMS 4049 aluminum alloy greater than 0.3 mg/cm² per 24 hr, determined in accordance with ASTM F483.

3.2.2.2.3 Low-Embrittling Cadmium Plate: Test panels coated with low-embrittling cadmium plate shall not show a weight change greater than 0.3 mg/cm² per 24 hr, determined in accordance with ARP 1511.

3.2.2.3 Hydrogen Embrittlement: Urea solution shall be non-embrittling, determined in accordance with ASTM F519, Types 1a, 1c, or 2a.

3.2.2.4 Effect on Transparent Plastics: Urea solution shall not craze, stain, or discolor Type C acrylic plastic, determined in accordance with ASTM F484. The urea solution shall not craze, stain, or discolor MIL-P-83310 polycarbonate plastic or polysulfone plastic, determined in accordance with test procedures specified in ASTM F484 on specimens stressed to an outer fiber stress of 3000 psi (20 MPa) for 30 min. + 2.

3.2.2.5 Effect on Painted Surfaces: Urea compound shall neither decrease the hardness of the paint film by more than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F502.

3.3 Quality: Urea compound, as received by purchaser, shall be uniform, uncoated, and free from foreign materials detrimental to usage of the urea compound.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of urea compound shall supply all \emptyset samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the urea compound conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), hydrogen embrittlement (3.2.2.3), and effect on transparent plastics (3.2.2.4) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for temperature stability (3.2.1.1), nonvolatile matter (3.2.1.2), melting point (3.2.1.3), and effect on painted surfaces (3.2.2.5) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, when a change in ingredients, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with all applicable requirements of ASTM D1568 and MIL-STD-105, Level S-2; a lot shall be all urea compound produced in one continuous manufacturing operation from the same lots of raw materials and presented for vendor's inspection at one time.

4.3.1 \emptyset When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3 and the report of 4.5 shall state that such plan was used.

4.4 Approval:

4.4.1 Sample urea compound shall be approved by purchaser before urea for production use is supplied, unless such approval be waived by purchaser. Results of tests on production urea shall be essentially equivalent to those on the approved sample.