Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 1731

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Revised

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 retardent 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 (AMS) and Aerospace Recommended Practices (ARP) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 4049 - Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.26Cr (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

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 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 Crazing 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 - Hydrogen Embrittlement Testing of Aerospace Materials

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120 except as specified in 2.3.4 and 2.3.5.

2.3.1 Federal Specifications:

QQ-A-250/13 - Aluminum Alloy Alclad 7075 Plate and Sheet

2.3.2 Military Specifications:

MIL-P-8184 - Plastic Sheet, Acrylic, Modified
MIL-P-25690 - Plastic Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant

2.3.3 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

2.3.4 U.S. Department of Labor, Occupational Safety and Health Administration Forms: Available from regional offices of U.S. Department of Labor, Bureau of Labor Standards.

OSHA Form 20 - Material Safety Data Sheet

2.3.5 Department of Defense Forms: Available from the local or cognizant DOD Contract Administration Services component.

DD Form 1813 - Material Safety Data Sheet

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, 15 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 ± 1 at 2°C ± 3 (35° F ± 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% tap 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 or QQ-A-250/13 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 (QQ-A-250/13) 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 nor cause a weight change of any single test panel of AMS 4049 or QQ-A-250/13 aluminum alloy greater than 0.3 (mg/cm^2)/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/cm^2)/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, Method 1a, 1c, or 2a.

3.2.2.4 Effect on Transparent Plastics: Urea solution shall not craze, stain, or discolor MIL-P-8184 or MIL-P-25690 stretched acrylic plastic, determined in accordance with ASTM F484. The urea solution, likewise, shall not craze, stain, or discolor polycarbonate or polysulfone plastics, determined in accordance with test procedures specified in ASTM F484 on specimens stressed to an outer fiber stress of 3000 psi (21 MPa) for 72 hr ± 1.

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 samples 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 perform such confirmatory testing as he deems 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 on the initial shipment of the product to a purchaser, when a change in ingredients or processing 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.

4.4 Approval:

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

4.4.2 Vendor shall use ingredients, manufacturing procedures, and methods of inspection on production urea which are essentially the same as those used on the approved sample urea. If any change is necessary in ingredients or in manufacturing procedures, the vendor shall submit for reapproval a statement of the proposed changes in material or processing and, when requested, sample urea. Production urea made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports: Unless waived by purchaser, the vendor of urea shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the acceptance test requirements and, when performed, the results of tests to determine conformance to the periodic test requirements and stating that the compound conforms to the other technical requirements of this specification. This report shall include the purchase order number, material specification number, manufacturer's identification, lot number, and quantity.

4.5.1 Reports of preproduction test results shall include an executed copy of OSHA Form 20 or DD Form 1813 Material Safety Data Sheet, or equivalent, covering product formulation. All requests for modification of formulation shall be accompanied by a similar form for the proposed formulation.

4.6 Resampling and Retesting: If any sample used in the above tests fails to meet the specified requirements, disposition of the urea may be based on the results of testing three additional samples for each original nonconforming sample. Failure of any retest sample to meet the specified requirements shall be cause for rejection of the urea represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each container shall be legibly marked to show not less than AMS 1731, purchase order number, manufacturer's identification, lot number, and quantity.

5.2 Packaging:

5.2.1 Urea shall be packaged in suitable containers of a type and size agreed upon by purchaser and vendor.

5.2.2 Containers of urea shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the urea to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.2.3 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 and 5.2.2 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Urea not conforming to this specification or to authorized modifications will be subject to rejection.

8. NOTES:

8.1 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Type and size of containers desired
Quantity of urea desired
Applicable level of packaging (See 5.2.3).