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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2475F

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Superseding AMS 2475E

Protective Treatments Magnesium Alloys

1. SCOPE:

1.1 Purpose:

This specification establishes the engineering requirements for producing chromate conversion coatings on magnesium alloys and the properties of the coatings.

1.2 Application:

This process has been used typically to increase corrosion resistance and to provide surfaces which will ensure maximum paint adherence, but usage is not limited to such applications. The dichromate treatment may not be suitable for alloys with high manganese content. The chrome pickle treatment may be used as touch-up for previously dichromate treated parts.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

There are no referenced publications specified herein.

3. TECHNICAL REQUIREMENTS:

3.1 Solutions:

3.1.1 Dichromate Treatment:

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3.1.1.1 Acid Solution: An aqueous solution containing 15 to 20% by weight of 48% hydrofluoric acid (HF).

3.1.1.1.1 In handling hydrofluoric acid, great care should be taken to avoid contact with the skin; rubber gloves, face shield, and protective clothing should be worn by operators.

3.1.1.2 Sodium Dichromate Solution: An aqueous solution containing 10 to 15% of sodium dichromate ($Na_2Cr_20_7:2H_20$) and 0.25% of either magnesium fluoride (MgF_2) or calcium fluoride (CaF_2) by weight. The solution shall be maintained in a saturated condition with respect to the alkaline earth fluoride by continuous immersion of a cloth bag, or equivalent, containing the compound.

3.1.1.3 Temperature: The hydrofluoric acid solution shall be operated at room temperature. The sodium dichromate solution shall be operated at not lower than 200 °F (93 °C) and preferably at its boiling point.

3.1.2 Chrome Pickle Treatment: Shall be as shown in Table 1.

TABLE 1 - Chrome Pickle Solution

Ingredients	Quantity
Sodium dichromate ($Na_2Cr_20_7:2H_20$)	1.5 pounds (680 g)
Nitric acid ($HN0_3$, sp gr 1.42)	1.5 pints (710 mL)
Water, to make	1 gallon (3.8 L)

3.2 Preparation:

3.2.1 Parts shall be cleaned to remove oil, grease, dirt, mill marking, heat scale, discoloration, or other surface contaminants which would interfere with the conversion coating process.

3.2.2 Castings which show oxidation may be immersed for ten seconds in a solution at room temperature containing 90 parts by volume water, eight parts by volume concentrated nitric acid ($HN0_3$, sp gr 1.42) and two parts by volume concentrated sulfuric acid (H_2S0_4, sp gr 1.84), washed thoroughly in cold, running water, dipped in hot water, and dried rapidly.

3.2.3 Parts which show oxide film or contaminants such as die lubricant may be cleaned by immersing for 1 to 15 minutes in an aqueous solution containing approximately 1.5 pounds per gallon (680 g/L) chromic acid and operated at 190 to 212 °F (88 to 100 °C), rinsing thoroughly in cold flowing water, dipping in hot water and drying rapidly.

3.3 Procedure:

3.3.1 Dichromate Treatment: Parts shall be treated after all machining operations and before assembly with dissimilar alloys, unless otherwise specified. Parts machined or marred after the dichromate treatment shall be chrome pickled as in 3.3.2 or treated by the touch-up process as in 3.3.2.2.

3.3.1.1 Prior to dichromate treatment, cleaned parts shall be immersed in the hydrofluoric acid solution (3.1.1.1) for not less than five minutes, or pickled by an equivalent procedure approved by the purchaser and rinsed thoroughly in cold, running water.

3.3.1.2 The wet parts shall be immersed in the sodium dichromate solution (3.1.1.2) for not less than 30 minutes, thoroughly rinsed in cold, running water, dipped in hot water, and dried rapidly with a clean, dry air blast.

3.3.2 Chrome-Pickle Treatment: Shall be used for local touch-up of previously dichromate-treated parts where additional finishing has been necessary after painting or where surfaces have been marred during other operations. It may be used for finished parts where dimensional tolerances permit.

3.3.2.1 The surfaces or local areas to be treated shall be flooded continuously with freshly prepared chrome pickle solution (3.1.2) by flowing, brushing, or swabbing, or parts shall be immersed in the solution at room temperature. Time of treatment shall, when dimensional tolerances permit, be 1/2 to 2 minutes; in other cases, time of treatment shall be as long as practicable without removing metal in excess of dimensional tolerances. Parts shall then be rinsed thoroughly with clean, running water and dried with a clean, dry air blast.

3.3.2.2 Proprietary solutions may be used for touch-up provided they perform the same function as the touch-up solution in 3.1.2.

3.3.3 Surfaces to be painted should be handled with extreme care after treatment to prevent rupture of the film or contamination by dirt or oil. Painting shall be done as soon after treatment as practicable.

3.4 Quality:

Surfaces of coated parts, as received by purchaser, shall be substantially uniform in color, texture, and appearance. There shall be no bare or definite light-colored areas, powdery areas, and darkening of the corners and edges.

3.4.1 Color of properly applied dichromate coatings may vary, depending on the alloy composition, condition of the solution, and length of time of treatment. On most alloys, color ranges from dark brown to black; however, some process/alloy combinations may produce different colors, including dark neutral gray and colder tone grays containing slight amounts of blue or green.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The processor shall supply all samples for processor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Quality (3.4) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests of processing solutions (See 8.2) to ensure that the coating will conform to specified requirements are periodic tests and shall be performed at a frequency selected by the processor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of coated parts to a purchaser, when a change in material and/or processing requires reapproval by the cognizant engineering organization, (See 4.4.2), and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing:

Each part shall be inspected. A lot shall be all parts of the same part number processed in a continuous series of operations in the same solutions and presented for processor's inspection at one time.

4.4 Approval:

4.4.1 The process and control procedures, a preproduction sample, or both, whichever is specified by purchaser, shall be approved by the cognizant engineering organization before production parts are supplied.

4.4.2 The processor shall make no significant change to materials, processes, or control parameters from those on which the approval was based, unless the change is reapproved by the cognizant engineering organization. A significant change is one which, in the judgment of the cognizant engineering organization, could affect the properties or performance of the parts.

4.5 Reports:

The processor of coated parts shall furnish with each shipment a report stating that the parts have been processed and tested in accordance with specified requirements and that they conform to the acceptance test requirements. This report shall include the purchase order number, lot number, AMS 2475F, part number, and quantity.