SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2436 | REV. D

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Superseding AMS 2436C

Coating, Aluminum Oxide Detonation Deposition

RATIONALE

This document has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Form:

This specification covers the engineering requirements for applying aluminum oxide to metal parts by detonation deposition and the properties of such coatings.

1.2 Application:

This process has been used typically to provide a hard, wear-resistant surface on metal parts, particularly those used under corrosive or elevated-temperature oxidizing conditions, but usage is not limited to such applications. This coating is not recommended for surfaces with deep vee-shaped grooves, blind cavities, narrow holes, or sharp corners, or where deformation of the basis metal may be expected.

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.

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2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM C 633 Adhesion or Cohesive Strength of Flame-Sprayed Coatings
ASTM E 384 Microhardness of Materials

3. TECHNICAL REQUIREMENTS:

3.1 Equipment:

Shall consist of a specially constructed machine in which the particles of coating compound are fed into the tube of a gun, suspended in a mixture of oxygen, acetylene, and nitrogen, and detonated, heating the particles to plasticity and propelling them at high velocity out of the gun barrel onto the part.

3.2 Coating Compound:

Shall consist of not less than 99% aluminum oxide, determined by a method acceptable to purchaser.

3.3 Preparation:

3.3.1 Surfaces to be coated shall be machined to allow for the finished thickness of the coating.

3.3.2 Parts requiring heat treatment or shot peening shall be so processed prior to coating.

3.3.3 Parts shall be cleaned to remove water, oil, grease, dirt, scale, paint, and other foreign materials detrimental to adhesion of the coating.

3.3.4 Parts shall be suitably masked to protect surfaces not required to be coated.

3.3.5 Surfaces to be coated shall be grit blasted to produce a uniform matte finish sufficient to provide good adhesion of the coating. The grit type and size shall be recorded in the approved process procedure for each part. Surfaces shall not be blasted with grit previously used on dissimilar materials.

3.4 Procedure:

The coating compound shall be deposited onto the designated surfaces to a sufficient thickness to permit finishing to specified dimensions. The temperature of the parts during deposition shall be controlled so as not to exceed 300 °F (149 °C).

3.5 Properties:

The coating on parts or representative test specimens shall conform to the following requirements.

3.5.1 Representative Test Specimens: Specimens as in 4.3.1 shall be prepared and coated in the same manner and under the same conditions as the actual parts.

3.5.1.1 Hardness: Shall be 950 to 1300 HV300, or equivalent, determined in accordance with ASTM E 384 as the average of not less than 10 microhardness readings taken on a cross-section of specimens as in 4.3.1.1.

3.5.1.2 Bond Strength: Shall be not less than 6000 psi (41.4 MPa), determined in accordance with ASTM C 633 or other procedure acceptable to purchaser on specimens as in 4.3.1.2.

3.5.1.3 Inclusions and Apparent Porosity: Foreign particle inclusions and apparent porosity shall be not more than 2.0% of the coating cross-section, determined by microscopic examination at 200X magnification of specimens as in 4.3.1.1.

3.5.1.4 Cracks and Interface Bond Separation: Shall not be present, determined by microscopic examination of the coating cross-section at 200X magnification of specimens as in 4.3.1.1.

3.5.2 Finished Parts:

3.5.2.1 Hardness: Shall be 950 to 1300 HV300, or equivalent, determined in accordance with ASTM E 384 as the average of not less than 10 microhardness readings taken on a cross-section of a part.

3.6 Quality:

The coating on parts, as received by purchaser, shall be adherent to the basis metal and shall have a uniform, continuous surface free from spalling, chipping, flaking, and other imperfections detrimental to usage of the coating.

3.7 Tolerances:

A maximum tolerance of +0.125 inch (+3.18 mm) is permissible on the boundaries of areas designated to be coated.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The processor of coated parts shall supply all samples for processor's tests and shall be responsible for the performance of all required tests. When tests are required on actual parts, such parts shall be supplied by purchaser. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the coating conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Thickness (3.4.1), hardness (3.5.1.1) and bond strength of test specimens (3.5.1.2), inclusion and apparent porosity of coated specimens (3.5.1.3), cracks and interface bond separation (3.5.1.4), quality (3.6), and tolerances (3.7) are acceptance tests and shall be performed to represent each lot.

4.2.2 Periodic Tests: Composition of coating compound (3.2) and hardness of the coating (3.5.2.1) are 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: 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 approval by the cognizant engineering organization (see 4.4.2), and when purchaser deems confirmatory testing be required.

4.3 Sampling and Testing:

Shall be not less than the following; a lot shall be all parts of essentially the same configuration, processed in a continuous operation, to the same range of thickness, with powder from the same batch, and presented for processor's inspection at one time:

4.3.1 Test Specimens: Two sets of specimens, one coated at the beginning and one coated at the end of each lot.

4.3.1.1 Hardness and microscopic examination test specimens shall be 3/8 inch (9.5 mm) cubes fabricated from the same generic class of material and condition as the parts represented and coated at an impingement angle 90 degrees to a thickness of 0.007 inch (0.18 mm) minimum.

4.3.1.2 Bond strength test specimens shall be solid cylindrical specimens 1.0 inch (25 mm) in diameter, fabricated from the same generic class of material and condition as the parts represented and coated at an impingement angle of 90 degrees on one flat face to a thickness of 0.007 inch (18 mm) minimum.