SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2485J

Issued MAY 1948
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Superseded by AMS 2485H

Coating, Black Oxide

1. SCOPE:

1.1 Purpose:

This specification covers the engineering requirements for producing black oxide coatings on parts and the properties of such coatings.

1.2 Application:

This coating has been used typically to improve the anti-chafing and anti-friction properties of carbon and low-alloy steel parts, particularly for sliding or bearing surfaces, by providing a finish coating which will retain an oil film, but usage is not limited to such applications.

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:

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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: http://www.sae.org

2.1 ASTM Publications:

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

ASTM G 46 Examination and Evaluation of Pitting Corrosion

3. TECHNICAL REQUIREMENTS:

3.1 Preparation:

3.1.1 The parts to be coated shall have clean surfaces, free from water-breaks.

3.2 Procedure:

3.2.1 The cleaned parts, while still wet, shall be immersed in one or more boiling aqueous alkali oxidizing baths for times and at temperatures (See 8.3) which will produce coatings meeting the requirements of 3.3 and 3.4.

3.2.2 Coated parts shall be washed thoroughly in running tap water to remove all traces of processing solution and salts. Parts shall not be allowed to dry during the entire sequence of operations until completion of this rinse.

3.2.3 Parts shall be thoroughly dried unless a water-displacing oil is used in 3.2.4, in which case complete drying may be omitted.

3.2.4 Parts shall be dipped in a suitable corrosion-preventive oil.

3.3 Properties:

Coated parts shall conform to the following requirements:

3.3.1 Smut Test: Coatings on parts before oiling as in 3.2.4, or on oiled parts after degreasing, shall show no indications of reddish-brown or green smut when wiped with a clean, white cloth.

3.3.2 Dimensional Change: When determined using a micrometer accurate to 0.0001 inch (2.5 mm), no dimensional change shall result from processing.

3.3.3 Oxalic Acid Spot Test: The coating, prior to application of corrosion preventative oil, shall be tested as follows. Clean, dry coated parts or specimens of the same composition and heat treat condition as the parts and processed with the parts represented shall be handled with clean cotton gloves. Each sample shall have deposited three drops of a 5% solution of oxalic acid on a flat surface. Permit the accompanying reaction to continue for eight minutes, followed by rinsing in cool water and drying. When examined, the area which was directly under the acid test solution drops shall exhibit a black or dark brown center with a light border. Areas under the drop, which exhibit a gray center and lighter border are marginal coatings and are not acceptable.

3.3.4 Surface and Intergranular Attack: The cleaning and coating process shall not result in any surface pitting, as determined by ASTM G 46, or in intergranular attack, determined on metallographically prepared cross-sections examined unetched at 400X magnification.

3.4 Quality:

Except as otherwise specified herein, the coating on polished surfaces shall be a uniformly lustrous black. Coating on other surfaces shall be black or dark gray in color, uniform on areas of equivalent surface roughness. Coating on all types of surfaces shall be free of spots of red oxide or an overall reddish-brown color but an overall reddish-brown cast on a basically black color is permissible. Coating shall be continuous, smooth, dense, and adherent and shall not rub off under any conditions incident to normal handling or storage.

4. QUALITY ASSURANCE PPOVISIONS:

4.1 Responsibility for Inspection:

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

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Smut test (3.3.1), oxalic acid spot test (3.3.3), and quality (3.4) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Surface and Intergranular attack (3.3.4) when parts 36 HRC or higher are being processed, and tests of cleaning and coating baths (See 8.2) to ensure that coatings will conform to specified requirements are periodic tests and shall be performed at a frequency selected by the processor unless frequency is specified by the purchaser.

4.2.3 All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of coated parts to a purchaser, on each lot, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing:

Shall be not less than the following; a lot shall be all parts made of the same material, heat treated to the same hardness or tensile strength level, processed in the same solution(s) in not longer than eight consecutive hours, and presented for processor's inspection at one time. Parts for tests shall be selected randomly from all parts in the lot.

4.3.1 For Acceptance Tests: Shall be as shown in Table 1.

Table 1—Sampling for Acceptance Tests

Lot Size	Quality	Smut Test	Oxalic Acid Spot Test
Up to 7	All	3	1
7 to 15	7	4	1
16 to 40	10	4	1
41 to 110	15	5	2
111 to 300	25	6	3
301 to 500	35	7	4
Over 500	50	8	5

4.3.1.1 Periodic Tests: Sample quantity shall be selected at the discretion of the processor unless otherwise specified.

4.3.2 When coated parts are of such configuration or size as to not be readily adaptable to specified tests or when nondestructive testing is not practical on actual parts, or when it is not economically acceptable to perform destructive tests on actual parts, separate specimens of the same class of alloy and heat treat condition as the parts represented, cleaned and coated with the parts represents may be used.

4.4 Approval:

4.4.1 The process and control factors, a preproduction part, or both, whichever is specified, 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 factors from those on which the approval was based, unless the change is approved 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.

4.4.3 Controls factors shall include, but not be limited to the following:

Cleaning method
Type of blackening bath used
Corrosion preventive oil used
Periodic test plan.

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 the specified requirements and that they conform to the acceptance test requirements. This report shall include the purchase order number, lot number, AMS 2485J, part number, and quantity.