Hard Anodic Oxide Coating
(Hard Alumite)
HARD ANODIZE
(HARD ANODIC COATINGS)

Riken Alumite Industry's hard anodizing technology provides reliability and durability for customers.

Meets the U.S. military specification MIL-A-8625F Amendment 1 Type III

Our hard anodic oxide coating has been applied to products in a wide range of fields such as satellite and aircraft parts and industrial machinery.

Hard alumite is a hard coating which is thicker and has greater abrasion resistance compared to common sulfuric acid alumite. In the Japanese Industrial Standards (JIS) H8603:1999 "Hard Anodic Oxide Coatings on Aluminum and its Alloys" and ISO 10074:1994 (the latest version was issued in 2017) "Hard Anodic Oxidation Coatings on Aluminum and its Alloys", hard alumite is defined as "an anodic oxide coating formed on aluminum materials in a cold electrolytic bath or special electrolytic baths prepared by applying various types of organic acid. Hard alumite is harder and superior in abrasion resistance compared with coatings treated with conventional methods." With our established technologies and know-how, we have offered hard alumite excellent in quality and abrasion resistance comparable to that for hard chrome plating.

Features

◎ Abrasion resistance: Especially excellent in sliding wear resistance with a good galling resistance.

◎Thickness: A thicker coating compared to conventional coatings compensates for the softness of aluminum and enhances product strength. This property is best exhibited at a thickness of 30 to 50μm.

◎Hardness: The coating provides a hardness of around 50HV greater than that shown in the JIS-H-8603 standard (Table1). (Depending on the type of alloy, hardness sometimes increases by 100HV or greater.)

◎Electrical properties: The specific resistance of hard alumite is reported to be approximately 4 x

$10^{15}\Omega\cdot$cm at 20 °C. Its breakdown voltage is so high that 1000 series alloys coated with a thickness of 25μm withstand the voltage of DC250V and that with a thickness of 50μm withstand the voltage ranging from DC800 to 1000V. This property allows hard alumite to be used as an insulating coating applied to heat sinks and other applications.

Table 1: Performance required by JIS H8603:1999/ISO10074:1994

Class	Material	Coating Hardness 0.05HV	Abrasive Wheel Wear Test	Abrasive Jet Test	Taber's Abrasion Resistance Test	Coating Mass mg/dm^2	Test Items (by the agreement between parties concerned)
Class 1	Wrought alloys other than those in Class 2	≥ 400	≥ 80 %	≥ 80 %	≤ 15.0 mg	≥ 1100	1. Coating thickness 2. Corrosion resistance (For sealed materials, it is impossible to attain both corrosion and abrasion resistances: No corrosion after 336h of salt spray test—only applicable to Class 1) 3. Dielectric strength
Class 2-(a)	2000 series wrought alloys	≥ 250	≥ 30 %	≥ 30 %	≤ 35.0 mg	≥ 950	
Class 2-(b)	7000 series wrought alloys 5000 series wrought alloys containing ≥2% of Mg	≥ 300	≥ 55 %	≥ 55 %	≤ 25.0 mg	By the agreement between the parties concerned	
Class 3-(a)	Castings containing < 2 % of Cu or < 8% of Si	≥ 250	By the agreement between the parties concerned				
Class 3-(b)	Castings other than those in Class 3-(a)	By the agreement between the parties concerned					

Standard performance and quality assurance -

*Note that the following standard performances are inapplicable to alloys containing 5 % or more of Cu or 8% or more of Si. Please contact us for performance and quality assurances for the above-

mentioned alloys.

◎Coating thickness: The thickness is specified based on the agreement between the parties concerned. *The standard coating thickness for the anodic coating Type III in the MIL-A-8625 is 50.8 ± 10.2 μm (0.002 ± 0.0004"). The thickness generally ranges from 25.4 to 76.2μm with the acceptable coating thickness tolerance of a specified thickness ±10.2 μm or ± 20 %.
(Please contact our sales department for the details of the possible coating thickness and tolerance because both values vary depending on the type of alloy. Since it is also possible to finish the product coating within the specified size tolerance, please feel free to contact us. We will provide the test results for individual products when required. To measure coating thickness, please note that depending on the product shape, some products only require non-destructive testing, while other products require destructive testing and cross-sectional observation/measurement. (Cross-sectional observation/measurement will require a cut-out specimen, time for delivery, and cost.)

◎Abrasion resistance: ASTM D4060 Taber® Abrasion Test (with a 1000 g load, CS-17 abrasive wheel, and 10000 cycles)

For alloys with a Cu content of 2% or higher (e.g. 2000 series)	A wear index of 3.5 mg/1000 cycles or less
For wrought alloys other than the above-mentioned alloys (Abrasion resistance is applied only to unsealed alloys.)	A wear index of 1.5 mg/1000 cycles or less

◎Coating hardness: Refer to Table 1. (Coating hardness shown in the Table 1 is inapplicable to that specified by the MIL-A-8625.)

◎Corrosion resistance (only applicable when sealing treatment is required): Guaranteed by ASTM B117 salt spray test for 336 hours

Applicable Standards

MIL-A-8625 Type III Classes 1 and 2 (the latest version: F Amendment 1)
SAE-AMS 2469 and other aeronautical standards

Sealing

Various standards clearly specify that sealing treatment should not be applied in the case where abrasion resistance is included in the performance requirements for a coating. Sealing treatment is

applied when corrosion resistance is required. However, sealing treatment dramatically reduces abrasion resistance. In the case where sealing treatment is required, therefore, there is a rule that abrasion resistance should not be pursued. However, unsealed anodic oxide coatings can be easily stained, which compromises product appearance. For applications requiring superior quality in appearance, therefore sealing treatment should be applied at the expense of abrasion resistance.

At the Riken Alumite Industry, we have offered various types of sealing treatment such as nickel acetate sealing treatment, dichromate sealing treatment, and steam sealing treatment.

Design Information

◎Depending on the type of alloy, the workability varies and the coating performance obtained after hard alumite coating differs: The type of alloy should be appropriately selected in consideration of coating performance to be obtained.

◎After coating, the surface of a product increases in thickness by approximately one half of the coating layer thickness, leading to an increase in product size: The product size before anodizing should be determined in consideration of the size change due to coating.

◎Sufficient coating would not be achieved when an object has sharp corners: In order to prevent the loss of coating at the corners, a 0.2 R chamfering is required for a 25 μm coating, and 0.3 R for a 50 μm coating.

◎In the coating of a product consisting of assembling components, electrolytic solution is likely to remain on the product surface, leading to erosion of the product. This type of product is recommended to be assembled after anodizing.

◎Please contact our sales staff for coating of a part with strict size tolerance, such as a mating part. We will provide a coating plan tailored to each product. It is also possible to mask the parts where coating is unnecessary.