

NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U.S. space program, to encourage their commercial application. Copies are available to the public at 15 cents each from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Masking of Aluminum Surfaces Against Anodizing

The problem:

Development of a method of preserving limited unanodized areas when aluminum surfaces are anodized with chromic acid. Such areas, from which the coating is normally etched subsequently with acid, are required for such purposes as electrical contacts.

The solution:

Masking of the areas with a mixture of two commercial materials: a "maskant" (masking material) and a thickening agent. The mixture consists of (parts by weight) 98 parts maskant and 8 parts of a 1:3 solution of thickening agent in toluene.

How it's done:

Used alone, this mixture is successful when a heavy coat is dried for 16 hours before the anodizing. For protection of large areas it combines well with a certain self-adhesive plastic tape. The tape is rolled on the metal's surface, and a thick coating of the mixture is applied to the edges of the tape and over 0.5 inch of the adjacent metal before being dried for 16 hours. When used alone, the tape permits anodizing under its edges. Both protectants are easily stripped after the anodizing.

All test specimens anodized were immersed for from 10 to 30 minutes in an alkaline solution at 71°C; rinsed with a water spray before a 30-second dip in water; immersed for from 10 to 30 minutes at 21°C in a bath containing, per liter of water,

120.4 ml of nitric acid, 48 g of chromic acid, and 10 ml of hydrofluoric acid; and rinsed with a water spray before a 30-second dip in water.

They were then placed in water containing chromic acid at 60 g/liter and maintained between 32° and 38°C; a voltage was applied and gradually increased, to maintain constant current in the specimens, until the level reached 40 v. After 60 minutes of such treatment the specimens were withdrawn and allowed to drain briefly. They were then immersed for 5 minutes in a rinse tank maintained between 82° and 100°C, and at a pH between 5.0 and 7.0 with chromic acid, before drying under ambient conditions.

Notes:

1. Anodizers or electroplaters may be interested.
2. Documentation is available from:
Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Price \$3.00
Reference: TSP69-10335

Patent status:

No patent action is contemplated by NASA.

Source: R. E. Thompson and G. B. Crawford of
Douglas Aircraft Company
under contract to
Marshall Space Flight Center
(MFS-12964)

Category 05

NASA TECH BRIEF



Testing of Aluminum and Steel Springs

The purpose of this test was to determine the effect of temperature on the mechanical properties of aluminum and steel springs. The test was conducted at three different temperatures: room temperature, 100 degrees Fahrenheit, and 200 degrees Fahrenheit. The results showed that the mechanical properties of both materials decreased as the temperature increased. The decrease was more pronounced for aluminum than for steel.

The test was conducted using a standard testing machine. The springs were subjected to a constant load for a period of 24 hours. The load was then removed and the displacement of the springs was measured. The displacement was found to be greater for aluminum than for steel at all three temperatures.

The test results are summarized in the following table:

Temperature (°F)	Material	Displacement (in)
Room	Aluminum	0.15
Room	Steel	0.10
100	Aluminum	0.20
100	Steel	0.12
200	Aluminum	0.25
200	Steel	0.15

The test results show that the mechanical properties of aluminum and steel springs decrease as the temperature increases. The decrease is more pronounced for aluminum than for steel. This is due to the fact that aluminum has a higher coefficient of thermal expansion than steel. As a result, aluminum springs expand more than steel springs when the temperature increases. This expansion causes the springs to lose their ability to exert a constant force.

The test results also show that the displacement of the springs increases as the temperature increases. This is due to the fact that the springs become more flexible as the temperature increases. The increase in flexibility is more pronounced for aluminum than for steel. This is due to the fact that aluminum has a lower modulus of elasticity than steel.

The test results are summarized in the following table:

Temperature (°F)	Material	Displacement (in)
Room	Aluminum	0.15
Room	Steel	0.10
100	Aluminum	0.20
100	Steel	0.12
200	Aluminum	0.25
200	Steel	0.15