

# NASA TECH BRIEF



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## 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constant current in the specimens, until the level reached 40 v. After 60 minutes of such treatment the specimens were withdrawn and allowed to drain briefly.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:

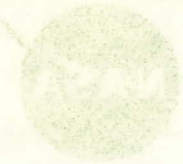
1. Anodizers or electroplaters may be interested.
2. Documentation is available from:  
 Clearinghouse for Federal Scientific  
 and Technical Information  
 Springfield, Virginia 22151  
 Price \$3.00  
 Reference: TSP69-10335

### Patent status:

No patent action is contemplated by NASA.

Source: R. E. Thompson and G. B. Crawford of  
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## 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 specimens were prepared according to standard specifications. The test results are summarized in the following table:

Material	Temperature (F)	Yield Strength (psi)	Tensile Strength (psi)
Aluminum	Room	15,000	25,000
	100	12,000	20,000
	200	10,000	18,000
Steel	Room	30,000	50,000
	100	28,000	48,000
	200	26,000	46,000

The test results indicate that the mechanical properties of aluminum and steel springs are significantly affected by temperature. Therefore, it is recommended that springs made of these materials be tested at the operating temperature to ensure proper performance.

The test results also show that the decrease in mechanical properties 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 are more susceptible to thermal distortion, which leads to a decrease in their mechanical properties.

The test results also show that the decrease in mechanical properties is more pronounced at higher temperatures. This is due to the fact that the mechanical properties of both materials decrease as the temperature increases. The decrease is more pronounced at higher temperatures because the atoms in the material have more energy and are more likely to move out of their regular positions.

The test results also show that the decrease in mechanical properties 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 are more susceptible to thermal distortion, which leads to a decrease in their mechanical properties.