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NASA TECH BRIEF

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Copper and Nickel Adherently Electroplated on Titanium Alloy

The problem:

Electroplating tightly adherent coatings of copper and nickel on Ti-6Al-4V alloy. Plating either with copper or nickel was required to protect the titanium alloy against attack by liquid oxygen.

The solution:

A process consisting of anodic treatment of the titanium alloy in a solution of hydrofluoric and acetic acids, followed by electroplating with the copper or nickel.

How it's done:

The process includes the following steps:

Anodic Treatment

1. Connect the titanium alloy parts anodically outside the tank. Adjust the voltage to 5 volts. Immerse the thoroughly cleaned and dried parts in a solution containing 875 ml of glacial acetic acid and 125 ml of 70 percent hydrofluoric acid. Adjust the voltage (within 1 minute) to 10 volts and maintain constant for 30 minutes.
2. Transfer to a rinse tank within 30 seconds. *Do not drain.* Rince thoroughly and transfer to plating tank.

Copper Plating

1. Connect parts and apply cathodic voltage of approximately 3 volts. Immerse parts in copper fluoroborate solution. Adjust current to 0.5 asi for 12 minutes. Do not interrupt current during plating since even a momentary stoppage may result in a laminated deposit.
2. Rinse thoroughly and dry.

Nickel Plating

1. Connect parts and apply cathodic voltage of approximately 3 volts. Immerse parts in nickel strike solution (Wood's nickel bath or all-chloride bath). Adjust current to 0.3 asi for 3 minutes. Do not interrupt current during plating since even a momentary stoppage will result in a laminated deposit.
2. Rinse thoroughly.
3. Connect parts and apply 3 cathodic volts. Immerse parts in nickel (sulfamate) plating solution. Adjust current to 0.5 asi for 10 minutes. Do not interrupt the current during plating, since even a momentary stoppage will result in a laminated deposit.
4. Rinse thoroughly and dry.

Note:

Inquiries concerning this process may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10532

Patent status:

No patent action is contemplated by NASA.

Source: Everett E. Brown
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Category 03

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