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# NASA TECH BRIEF



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## Chemical Milling Solution Reveals Stress Corrosion Cracks in Titanium Alloy



Untreated



Treated

During the past several years the hot salt stress corrosion cracking of various titanium alloys has been studied. One problem associated with this research has been the difficulty of observing extremely small stress corrosion cracks. The standard technique of metallographic polishing and etching was successful in many cases but is tedious and requires polishing equipment as well as a microscope.

It was discovered that a solution of the type used for chemical milling of titanium alloys will reveal stress corrosion cracks without special surface preparation. The solution consists of 10 parts HF (concentrated), 60 parts H<sub>2</sub>O<sub>2</sub> (30% concentration), and 30 parts H<sub>2</sub>O, by volume. The surface is simply rinsed in water and dried, swabbed with the solution for 10 to 30 seconds, and rinsed again in water. The cracks can be observed

(continued overleaf)

by the naked eye or at low magnification. The technique is especially applicable to large specimens or hardware where polishing would be impractical. The solution may also be useful in revealing small machining cracks or fatigue cracks, but should not be used when examination must be totally nondestructive.

The photograph illustrates stress corrosion cracks in a Ti-8Al-1Mo-1V titanium alloy which has been treated with the solution.

**Note:**

Inquiries concerning this innovation may be directed to:

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**Patent status:**

No patent action is contemplated by NASA.

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