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NASA TECH BRIEF

Stress Corrosion Crack Inhibiting Method for Titanium

A method is proposed for the prevention of stress corrosion cracking of high strength titanium alloys under exposure to aqueous and other solvent environments. It has special pertinence to alloys that contain a high weight percent of aluminum.

The method requires adding a quantity of oxyanions to the liquid in excess of the number of chloride, bromide or iodide ions present. The oxyanions are generally phosphates, chromates, sulfates, nitrates, or carbonates. Since the cation does not affect the results, the salts of potassium, sodium, lithium, or others may be used. Additionally, organic compounds that contain oxyanion groups, such as nitromethane, may be used in organic solvents.

The amount of additive required is determined by the quantity of residual chloride, bromide or iodide ions present in the fluid. A significant excess of oxyanions should be present relative to the estimated amount of chloride or other harmful ions present. Generally, the molar concentration of oxyanion is set from 10 to 100 times higher than the concentration of the halide ions.

The proposed method is particularly concerned with the problem of residual chloride, bromide, or iodide ions in titanium metal alloys that are exposed to inert solvents bearing traces of the same halides. Where high concentrations of halide ions (on the order of one molar) are present in the solvents, stress corrosion cracking is difficult to prevent.

Applications may include fuel and storage tanks where oxyanions could be added to the contents of titanium alloy containers.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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Reference: TSP70-10129

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: T. R. Beck of
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Category 03