Designation: B481 – 68 (Reapproved 2013)

Standard Practice for Preparation of Titanium and Titanium Alloys for Electroplating[1]

This standard is issued under the fixed designation B481; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Full utilization of the light weight and high strength of titanium is prevented by the tendency it has to gall and seize and by its lack of corrosion resistance at elevated temperatures. Frequently these limitations can be overcome by electrodepositing upon the titanium a metal with satisfactory properties. Titanium is an active metal that rapidly forms an adherent oxide coating in the presence of oxygen and water. This coating prevents the application of adherent electrodeposits by the more familiar preparative processes. For this reason, the special processes described in this practice were developed.

1. Scope

1.1 This practice describes processes that have been found to be successful in producing adherent electrodeposits of good quality on titanium and certain titanium alloys. Not all of the processes that have been reported as successful are described, but rather three basic ones that have had the widest use. A rather complete listing of the published work on electroplating on titanium is given in the list of references which appear at the end of this practice.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For a specific hazard statement, see 3.1.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B343 Practice for Preparation of Nickel for Electroplating with Nickel

3. Reagents

3.1 *Purity of Reagents*—All acids and chemicals used in this practice are technical grade. Acid solutions are based upon the following assay materials (**Warning—**Use hydrofluoric acid with extreme care.):

Hydrochloric acid	37 mass %, density 1.184 g/mL
Hydrofluoric acid	60 mass %, density 1.235 g/mL
Hydrofluoric acid	71 mass %, density 1.260 g/mL
Hydrofluoric acid	100 mass %, density 1.0005 g/mL
Nitric acid	69 mass %, density 1.409 g/mL

3.2 *Purity of Water*—Use ordinary industrial or potable water for preparing solutions and rinsing.

4. Process No. 1

4.1 *Cleaning*—Remove oil, grease, and other soil by appropriate conventional processes such as vapor degreasing, alkaline cleaning, grinding, or blasting.

4.2 *Activating*—Activation may be done by chemical or electrochemical etching or liquid abrasive blasting. It is possible that all three processes will work equally well on pure titanium and all common alloys; however, only those for which each process has been demonstrated to be successful are given here. The suitability of a process for an alloy not listed should be experimentally determined before committing production parts.

4.2.1 *Chemical Etch:*

4.2.1.1 The following procedure is suitable for commercially pure titanium and for 6Al-4V, 4Al-4Mn, and 3Al-5Cr.

4.2.1.2 *Pickle*—Immerse in the following solution, at room temperature, until red fumes are evolved:

[1] This practice is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatingsand is the direct responsibility of Subcommittee B08.02 on Pre Treatment.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.