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## NTST Titanium Nitride (TiN) Coatings

### General Information:

TiN is an extremely hard ceramic material, often used as a coating on titanium alloys, steel, carbide, and aluminum components to improve surface properties. TiN is non-toxic and meets FDA guidelines. To our knowledge, NTST is the first company to fabricate thick thermal spray coatings of TiN. These NTST TiN coatings are 500 times thicker than traditional thin films fabricated using physical and chemical vapor deposition deposition.

NTST TiN coatings possess an ideal combination of hardness, toughness, adhesion, and inertness. The coatings have a high service temperature (i.e., m.p. = 2900 C, 5250F) are electrically conductive, non-oxidizing, and resistant to most chemicals. TiN can be used in applications to eliminate galling, fretting, wear, and low friction. Figure 1 illustrates typical NTST fabricated TiN coatings.

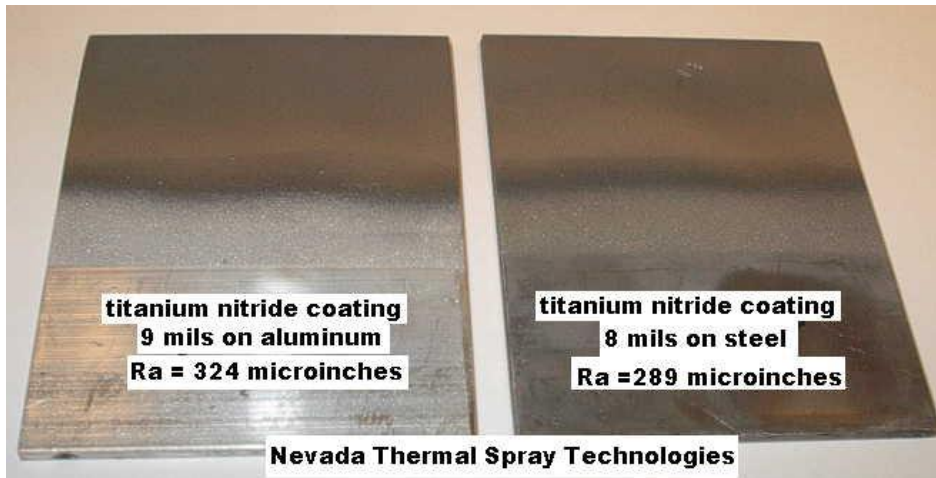


Figure 1. NTST TiN coatings.

### TiN Applications:

Oil and gas exploration: TiN maintains its integrity at elevated temperatures which is critical during deep drilling and extraction. It is a superior choice for preventing abrasive wear and erosion. TiN is highly effective at resisting saltwater corrosion for the underlying metal substrates. TiN works because it does not react with the chlorides found in seawater and harsh chemicals. The coating provides a very tough wear coating that holds up well against sand, debris, and high velocity water. To ensure TiN coatings last in saltwater environments, a multilayered coating, such as alternating layers of Ti and TiN have been considered.

General & Industrial tooling: TiN films have been used in medical devices (e.g., scalpel blades, implants). TiN films have been applied to many components from pumps to sporting goods; and have been used for edge retention and corrosion resistance on machine tooling, such as drill bits and milling cutters.

Military and aerospace: Components on the space shuttle and International Space Station have utilized TiN films.