

nano Al-Trans™ IVD Field Repair



Corrosion Resistance: 5000 hrs Salt Spray ASTM B117

Metallurgical Bond: Strong Adhesion

Field Repairable Tool: KM-Mobile Coating System

Coating Thickness: 25 to 100 microns

Fully Dense Coatings >99%



nano Al-Trans® (Al based composite)

High strength steels such as 300M, Aeromet 100, and 4340, typically used for landing gear components, require a corrosion protection coating. Cadmium coatings, which were used in the past, are no longer environmentally acceptable for these applications. Aluminum Ion vapor deposition (Al-IVD) is currently the accepted method for replacement of cadmium corrosion protective coating. Unfortunately, the IVD process cannot be used for field repair of these or other aluminum based electroplating techniques. Thus, the Navy Air Warfare Center at Patuxent River, MD awarded Inovati a SBIR Phase II contract to develop and qualify environmentally acceptable methods of spray depositing aluminum coatings for repair of aluminum IVD on military aircraft.

Inovati has developed a superior aluminum based composite coating, nano Al-Trans®, with exceptional corrosion resistance and a portable Kinetic Metallization-Mobile Coating System for applying the coating. Kinetic Metallization (KM) is a low-cost spray deposition process that uses a friction compensated sonic nozzle to deposit metallic powders at very low temperatures. The KM process avoids the oxidation and thermal distortion that results from coatings applied with thermal spray. This approach is being refined under the SBIR to develop an efficient method of field repair of these critical coatings.

Nano Al-Trans®, and the KM process avoids the expensive elaborate equipment required for IVD, molten salt bath plating and Alumiplate processes. nano Al-Trans®, can be used as the primary coating on critical parts. It has the added benefit of providing a true metallurgical bond to the substrate for high adhesion strength and it's near zero porosity gives it a corrosion resistance that has survived more than 5000 hours of salt spray and passed SO₂ salt spray per ASTM D1654-92.

KM is a low temperature deposition process that employs a specially designed, two-phase, friction compensated sonic nozzle to accelerate micron-size powder particles entrained in a helium carrier gas. The sonic nozzle directs the gas/particle suspension at a temperature well below the powder's melting point onto a substrate. The high-speed collision (700-1000 m/s) of the micron-size powder particles cause very large strain and strain rates in the particles, which produces depositions having unique strain-hardened properties resulting from plastic deformation. Metallurgical bonding is achieved exclusively through solid-state reaction - bulk melting does not occur.

KM Benefits

- Environmentally safe
- Low cost
- Low temperature
- Field repairable
- No hydrogen embrittlement
- No soundproofing
- No grit blasting
- No explosive gas

nano Al-Trans™ Characteristics

- Near zero porosity
- High adhesion strength
- High corrosion resistance

Application Areas

- Cadmium replacement
- Ion-Vapor Deposition (IVD) repair
- Alumiplate repair
- Electrical grounding strips
- Aluminum-based corrosion resistance