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APV ENGINEERED COATINGS
APV P-1 POWDER

APV P-1 powder is a unique inter-metallic powder composed of Aluminum, Chromium and Refractory Oxide. After activation, it can be used to coat a variety of metals and alloys. During processing at an elevated temperature, Aluminum and Chromium are transported and diffused into the base metal to impart both high temperature oxidation and corrosion resistance to the part. **P-1** has been used to enhance these properties on parts in gas turbine engines. It has also been used in automotive, chemical, heat-treating and other industries. Coating cycles, including temperature and time, are available for coating a variety of metals. After processing, a small quantity of **APV R-3** replenishing powder is added to the P-1 to maintain the concentration of the components.

What are metal diffusion coatings?

These are alloy coatings formed on the surface of a metal by high and low temperature metal diffusion.

Diffusion Aluminide Coatings

These coatings are formed by deposition and diffusion of Aluminum into the surface of another metal. Nickel base and Cobalt base superalloys are used extensively in the hot section of gas turbine engines and include blades, vanes and combustion chambers. The best corrosion and heat resistance coatings for superalloys contain Aluminum and Chromium as provided by the P-1 powder. Chromium Aluminide coatings can also be formed on steel and stainless steel to provide corrosion and heat resistance coatings.

Composition of Aluminide Coatings

Nickel (Chromium) Aluminide is formed on Nickel base superalloys and Cobalt (Chromium) Aluminide is formed on Cobalt base superalloys.

Powder-Pack Cementation Technique of forming Chromium Aluminide coatings

1. Prepare powder mixture of Aluminum, Chromium, Aluminum Oxide and Ammonium/Aluminum Chloride.
2. Place the mixture in a steel retort.
3. Place superalloy parts in the powder.
4. Place retort in an outer inconel retort with sand seal.
5. Heat under Hydrogen or Argon to temperature of 1900°F.
6. During heating, the Ammonium Chloride decomposes to form Hydrogen Chloride.
7. The Hydrogen Chloride reacts with the Aluminum and Chromium to form gaseous Aluminum and Chromium Chloride.
8. The Aluminum and Chromium Chloride contacting the superalloy part decomposes and deposits Aluminum and Chromium that under heat diffuses into the superalloy to form the protective Chromium Aluminide coating.