TRIBOMET® MCrAlY Coatings

The Technology

Praxair TRIBOMET® coatings are electro-deposited composites which are applied by a patented process. They are produced when particles which are kept in suspension in an electroplating bath settle onto the component and become entrapped by the depositing metal, See Fig.1.
TRIBOMET® MCrAlY coatings are produced by co-deposition of alloyed powders of specified particle size distribution (typically incorporating a selection of Cr, Al, Y, Si, Hf, Ta, Re) with nickel and/or cobalt from conventional electroplating solutions, followed by a vacuum heat treatment, See Figures 2 & 3.
There are a wide range of compositions available, along with compositions that can be specifically tailored to the customer's requirements.
TRIBOMET® MCrAlY coatings are Praxair's electrodeposited version of the high temperature oxidation and corrosion resistant coatings.
These oxidation and corrosion resistant coatings are also used as bond coats for thermal barrier coatings. They are used to protect gas turbine components against hot gas corrosion at temperatures up to 1150°C.

Typical Applications –

Aerospace, Industrial Gas Turbines, Power Generation and Marine.

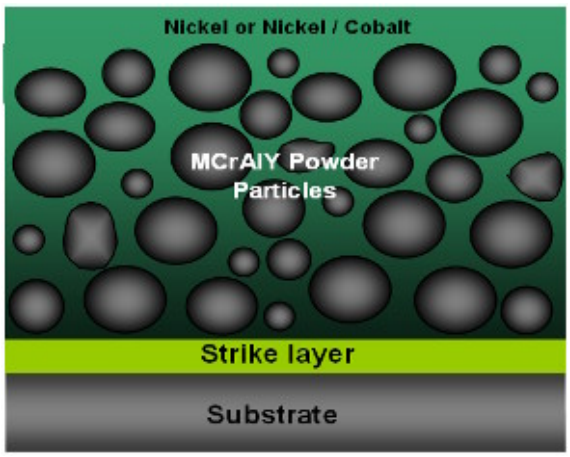

Fig.1 MCrAlY composite

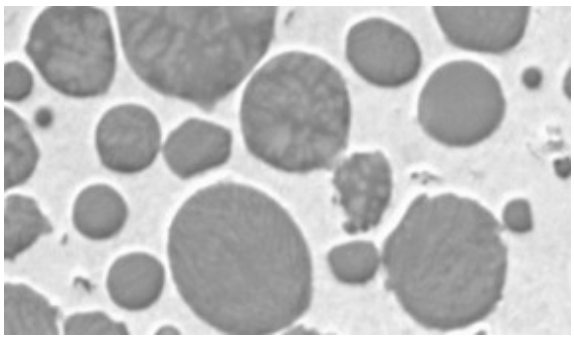
Fig.2 MCrAlY as plated

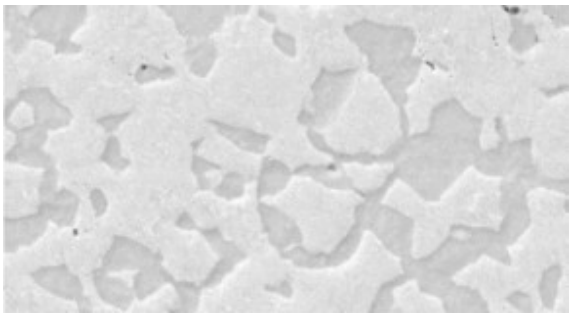
Fig.3 MCrAlY after heat treatment

Advantages:

- Provides excellent oxidation and corrosion resistance, better than thermally sprayed equivalent. Fig.4.
- Non-line-of-site faces and complex geometries can be coated.
- Excellent adhesion >30,000 psi.
- A wide range of compositions are possible.
- Coatings can be plated to size with excellent thickness control and uniformity around complex geometries.
- Minimal cooling hole reduction and no blockage.
- Coatings are 100% dense.
- Applied to low or high volume manufacture.
- No component distortion.
- Can be diffusion heat treated over a wide range of temperatures – typically 1000 to 1150°C.
- Used as a bond coat for thermal barrier coatings.

Praxair Surface Technologies Limited,
Oldmixon Crescent, Weston super Mare. BS24 9AX
http://www.praxair-gmbh.de/

Praxair Partnership Approach

- Optimization of TRIBOMET® coatings are achieved when the coating has been “designed in”.
- The Weston facility is the home of PST’s Global TRIBOMET® Research and Development.
- Capable to support customer’s applications and discuss the possibilities for new coating chemistries.

Suitable Base Materials

- TRIBOMET® MCrAlY coatings can be applied to steels, aluminium, nickel and cobalt based alloys.
- Components can be cast, forged, rolled or extruded.

Coating to Size

- TRIBOMET® MCrAlY coatings are plated to final dimension, no machining required.
- TRIBOMET® MCrAlY can cover complex geometries tailored to specific requirements, Figs. 5 – 8.
- Typically as plated values are 2–3µmRa. MCrAlY coatings can also be vibro finished to < 1.5 µmRa.

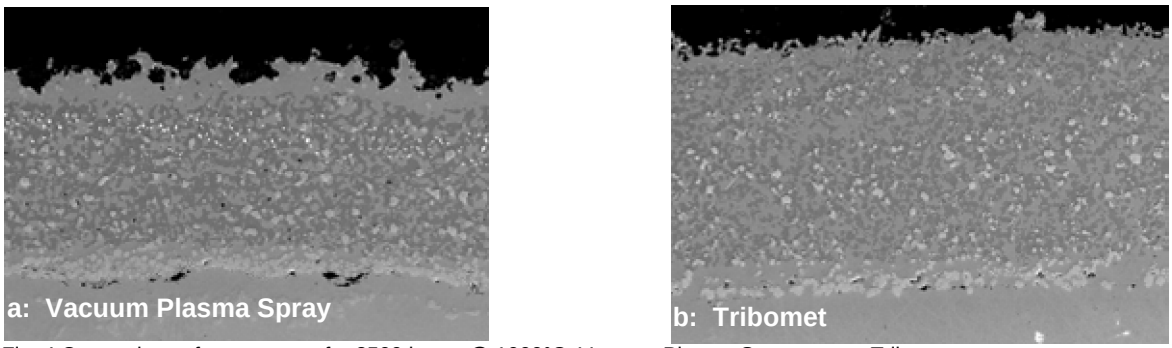

Fig. 4 Comparison after exposure for 2500 hours @ 1000°C, Vacuum Plasma Spray versus Tribomet

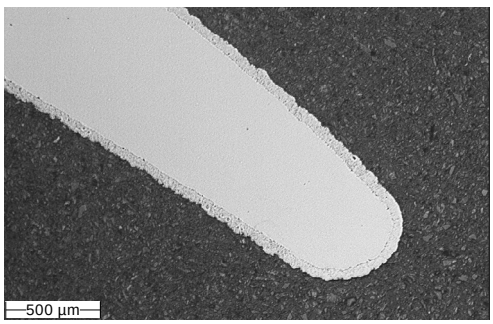

Fig. 5 Distribution around Aerofoil Trailing Edge

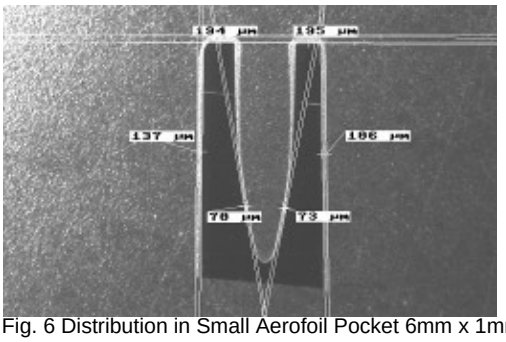

Fig. 6 Distribution in Small Aerofoil Pocket 6mm x 1mm

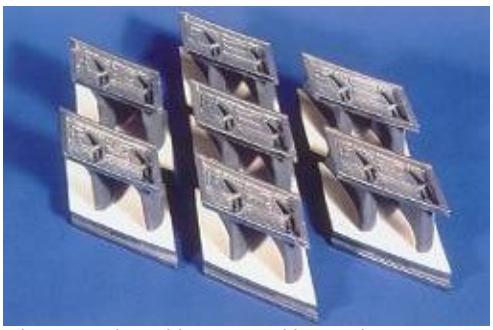
Fig. 7 Nozzle Guide Vanes with McrAlY & TBC

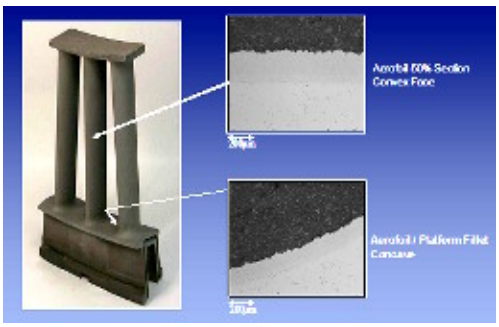
Fig. 8 Distribution over Turbine Triple Vane

Quality Assurance and Approvals

Praxair Surface Technologies is committed to ensuring every product is made in accordance with our quality standards and our development and production partners:-

- Performance Review Institute – Aerospace Standard 9100 (PRI - AS9100).
- National Aerospace and Defense Contractors Accreditation Program (NADCAP).
- Rolls-Royce.
- General Electric (GE).
- British Aerospace (BAE Systems).
- Pratt & Whitney.
- Safran Group.