

Gas Turbine Hot Section Oxidation and Corrosion Protection

The LSR™ process provides a flexible, compact and economical alternative of applying plain or modified aluminides internally and/or externally on Ni, Co, and Fe based alloys. The microstructure, chemistry and oxidation behavior is similar or superior to the conventional high activity aluminide coatings. The ease of application and minimal environmental requirements facilitates the use of the LSR™ process in manufacturing cells and turbine overhaul plants, and makes it a direct replacement for obsolete, uneconomical, and environmentally challenging processes such as pack, CVD, and electroplating.



**RB211 Blade
Coated with LSR™**

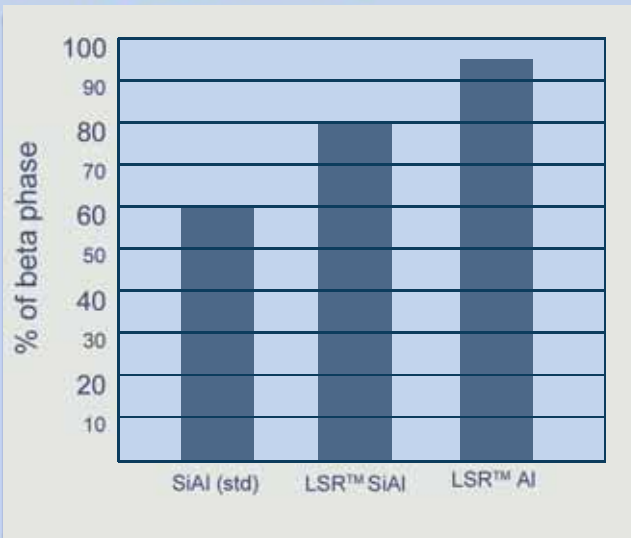
Process Advantages

- Superior Performance
- More reliable Masking and Quality Control
- OEM Approved with Proven Service on a range of popular engines
- Safer and less challenging for environment than conventional coating processes
- More flexible: diffusion temperatures and times can be matched with other heat treatment operations

Frame 7 Row 2 Buckets Coated with LSR™



Coating Performance



The determining factor in coating protection and life is the beta phase aluminum content. In laboratory cyclic oxidation tests both the LSR™ Al simple aluminide, and the LSR™ SiAl silicon aluminide retain their critical beta phase aluminum with superior performance compared to the standard commercial slurry aluminide used by the industry. This results in increased oxidation protection for turbine components.

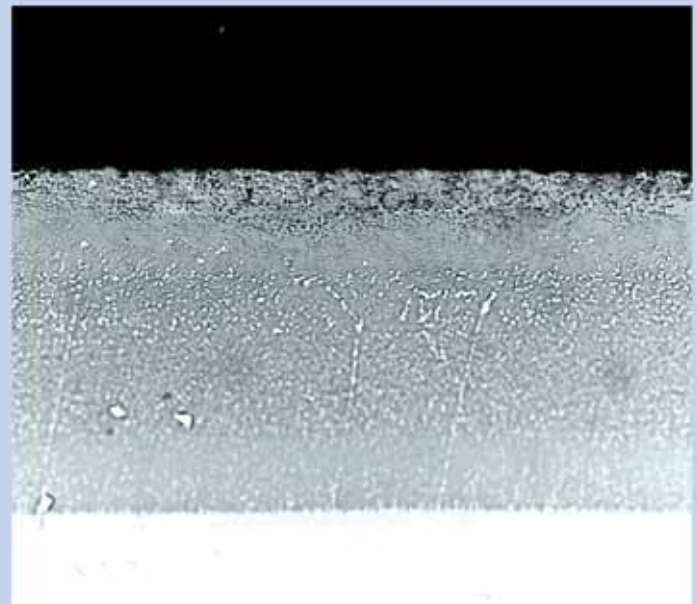
Comparative cyclic oxidation behavior of LSR coatings and the standard coating as characterized by remnant beta phase aluminum content after 650 cycles at 1120°C.

Coating Characteristics

A variety of aluminide coatings with different compositions and microstructures can be produced by the LSR™ process. Some of the flexibility arises from the ability to incorporate additional modifying elements as alloys in the slurry mixture. Secondly, the duration and temperature of the diffusion cycle can be modified to generate different levels of interdiffusion with the substrate and improve coating ductility.

Modified LSR™ Coatings

The LSR™ process has the potential to be used to produce coatings with unique chemistries. For example, Palladium can be used in place of, or with Platinum to produce more cost effective coatings on internal and external surfaces of blades and vanes. Also, other beneficial elements such as Chromium, Rhenium, Hafnium, Zirconium and Yttrium can be incorporated using the LSR™ process to produce novel coating structures for future evaluation.



Typical LSR™ Coating Microstructure.