EQ Coating

for Next Generation TBC and Environmental Coating Systems

National Institute for Materials Science, Tsukuba, Japan

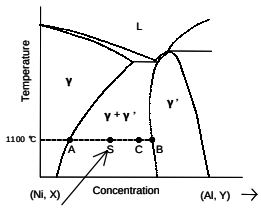
New Bond Coat System, "EQ coating"

Concept

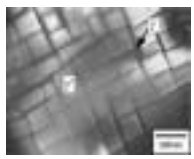
Equilibrium (thermodynamic) with the substrate = EQ Coating

Objective

To develop new bond coat systems that hinder interdiffusion with the substrate of Ni-base single crystal superalloy, so the formation of detrimental SRZ can be minimized.



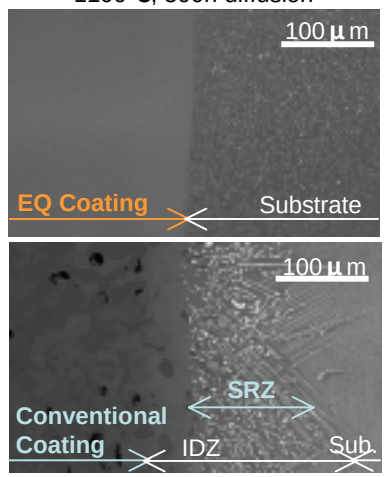
Substrate



The microstructure of γ / γ ' in Ni-base superalloys.

Compositions of EQ bond coat are designed along the tie-line of the substrate to achieve thermodynamic equilibrium.

- 1100℃, 300h diffusion -



New EB-PVD Apparatus, "EB Coater-CerM1"

Apparatus Specification

EB Power	16kW 1 Gun
Substrate Temp.	Max. 1100℃
Substrate Size	Max. φ200mm, L350mm
Substrate Weight	Max. 10kg
Atmosphere	Vacuum, Oxygen, Inert Gas
Coating Rate	100 μm/Hr
Ingot Size	Max. φ50mm, L200mm

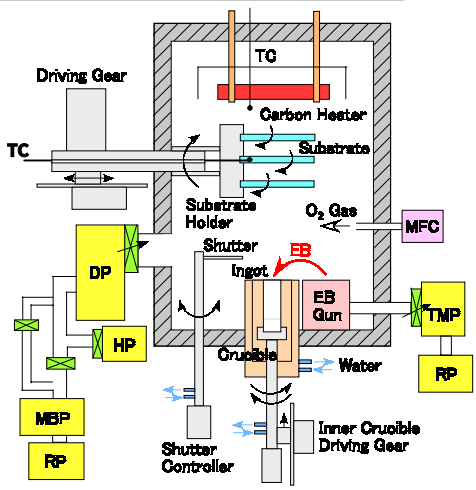


Fig. Schematic diagram of the coating chamber

Features of Apparatus

- Inner Carbon Heater with 30kW, 3 Sets
  Precise Control of High Substrate Temp.
- Divided Crucible
  Inner Crucible : Up and Down Moving
  Rotation
  Flexibility in Ingot Shape and Size
- Controllable Shutter
  Control of Deposition Structure

YSZ Formation on EQ Coating

Coating Conditions

Pre-oxidation: 0.2Pa O_2
1072℃,1Hr
Substrate Temp. : 1007℃

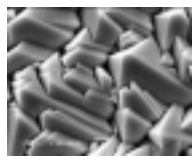


Fig. Surface of 7YSZ

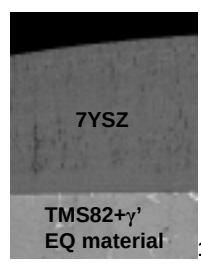


Fig. Vertical sectional microstructure of TBC