

Development of TBC and EBC for Gas Turbine

Keywords : TBC, EBC, Thermal properties, Corrosion properties

Background

Thermal barrier coatings (TBC) and Environmental Barrier Coatings (EBC, ex, SiC_f/SiC , SiC) have received considerable attention because they increase the thermal efficiency of gas turbine engines by increasing the gas turbine inlet temperature and reducing the amount of cooling air required for the hot section components.

Aim

Among the interesting TBC candidates, a new zirconates (ex, $\text{Gd}_2\text{Zr}_2\text{O}_7$) with superior with pyrochlore or fluorite structure have some favorable properties. The aim is to evaluate the corrosion resistance, life time, residual stress at interface and mechanical properties of TBC and EBC coatings.

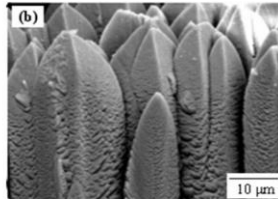
Advanced Research Topics

Properties and Development of Thermal Barrier Coatings

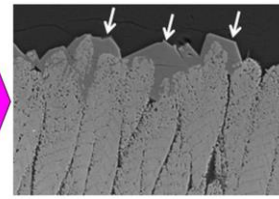
(CMAS: $\text{CaO-MgO-Al}_2\text{O}_3\text{-SiO}_2$)



Volcanic ash

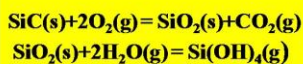


YSZ coatings by EB-PVD

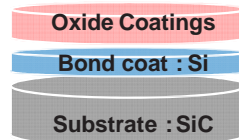


Reaction with volcanic ash

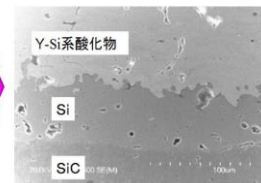
Properties and Development of Environmental Barrier Coatings



SiC corrosion by steam



EBC design



Microstructure of EBC

Publications

- B.K.JANG *et al.*, Ceram. International, 42 (2016) in publication.
- B.K.JANG *et al.*, J. Ceram. Soc. Jpn., 124 (2016) in publication.
- B.K.JANG *et al.*, Surf. Coat. Technol., 284 (2015) 57-62.

Summary

- Development of low thermal conductivity TBC materials
- Development of high corrosion-resistance EBC materials
- Evaluation of thermal, corrosive properties and high temperature stability

Research outcome

- Application for high temperature materials with superior corrosion-resistance against CMAS and volcanic ash
- Application for superior corrosion-resistance EBC materials



Byung-Koog Jang, Energy Infrastructure Materials Field
E-mail : JANG.Byungkoog@nims.go.jp