Nanostructured materials | Jožef Stefan Institute Ljubljana, Slovenia

SEMINAR

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Defect Engineering in Development of Low Thermal Conductivity Materials

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Increasing thermal efficiency and lower emissions require gas turbine designers to further increase the combustion temperature that leads to the high temperature components such as combustion chambers, blade and vanes surfaces face more rigorous conditions. Therefore, there is urgent demand to develop new ceramic coatings with even lower thermal conductivity, higher stability and durability than currently used thermal barrier coatings coating on the surface of high temperature alloy components.

Defect engineering has attracted much attention in seeking better low thermal conductivity materials since lattice defects play a crucial role in phonon scattering and thermal conductivity reduction. Oxygen vacancies and substitutions are proven to be the most effective, while the accompanying lattice distortion is also of great importance. In this talk, recent advances of reducing the thermal conductivity of potential thermal barrier coating materials by defect engineering are comprehensively reviewed. Effects of the mass and size mismatch between the defects and the host lattice are quantitatively estimated and unconventional thermal conductivity reduction caused by the lattice distortions is also introduced. Finally, challenges and potential opportunities are briefly assessed to further minimize the thermal conductivity of thermal barrier coatings materials in the future.

In this presentation, effects of macro defects on the heat transfer in porous ceramics are also talked including the characterization method as well as modeling.

Kindly invited.