



DIPARTIMENTO DI SCIENZE CHIMICHE



DIPARTIMENTO DI INGEGNERIA INDUSTRIALE



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

24 maggio, ore 11.30
Aula P, Dipartimento di Scienze Chimiche

Seminario

“Ceramics for efficient energy conversion – Material development based on thermodynamic considerations”

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Ceramics are an extremely important group of materials for improving existing technologies and developing new ones due to their versatile and outstanding properties. Therefore, ceramics are an integral part of many energy-related applications, e.g. as thermal insulation and protective coatings at high temperatures in corrosive atmospheres in gas turbines, as electrode materials and solid electrolytes in batteries as well as fuel cells or as thermoelectrics. In view of climate change, advanced ceramics are thus playing an important role in the required energy and process transition. New ceramic materials, i.e. new compositions and material systems, with improved properties are needed to increase the performance and efficiency of processes and explore new applications. In general, in terms of application and material development, a detailed understanding of the considered material system, including phase stability and phase equilibria, as well as knowledge of the energies and driving forces for the formation of stable and metastable phases, is essential. The thermodynamic approach of the CALPHAD method (CALculation of PHase Diagrams, computer coupling of phase diagrams and thermochemistry) provides a solid foundation in the development and investigation of new ceramics (and materials in general) and is a powerful development tool in materials (process) engineering.

The successful combination of thermodynamic considerations in the development of new ceramic materials is highlighted in the lecture. Three different approaches to knowledge-based material development are discussed based on thermal barrier coatings for gas turbines. The focus lays on the various contributions of the CALPHAD method to material development.

Prof.ssa Silvia Gross (DiSC)
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