



**JOINT GRADUATE MATERIALS ENGINEERING, UD FRAUNHOFER
CENTER & CETRASE SEMINAR**

**“Potential and Challenges for the Application of Smart Advanced Ceramic
Materials”**

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Abstract

Advanced ceramic materials offer enormous potential for innovations in the fields of efficient energy conversion and storage, propulsion systems, smart structures, sensor technology as well as environmental technology. The joint application of structural and functional ceramic process technologies such as ceramic thick film or/and thin film deposition allows for unique combination of electronic, ionic (electrochemical) and mechanical materials properties enabling for development of new, highly integrated systems in the aforementioned fields.

As a first example, fuel cell systems development for both mobile and stationary applications are presented. Such fuel cell systems allow for ultra high efficient power generation. In the combined heat and power (CHP) mode, efficiencies above 95% can be reached. Since the load following capability of fuel cells is limited, we also develop new ceramic based storage systems. These storage systems also can be used along with renewable power generation technologies (PV, wind) to solve the problem of base load feed in. Examples for development of Li-Ion batteries as well as high temperature NaNiCl batteries are presented. As an example for the potential of ceramic materials in the field of environmental technology, ceramic membranes are discussed. Such membranes can be used for micro-, ultra- or nano-filtration of liquids and gases. For this, a control and reduction of pore sizes below the 1 nm range is required.

Bio

Prof. Alexander Michaelis studied physics and received his doctorate in the field of electrochemistry. In 1996 he accepted a position at Siemens AG working in the field of microelectronics amongst others at the DRAM Development Alliance in East Fishkill, New York. In 2000 he began to work for Bayer AG in Leverkusen changing subsequently to H.C. Starck GmbH, a Bayer subsidiary, where he was head of the Electroceramics and New Business Development departments. Since 2004, he has been director of the Fraunhofer Institute for Ceramic Technologies and Systems IKTS and has been holding the chair of Inorganic Nonmetallic Materials at TU Dresden.

He has more than 40 patent families in materials science, microelectronics, and electronics and provided more than 100 publications. In 2012 Prof. Michaelis was awarded the ACerS Bridge Building Award for his contributions in the field of energy and environmental engineering.

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