

NANOSCIENCE COLLOQUIUM

Functional Ceramic Nanostructures by Combining 3D printing with Atomic Layer Deposition

Prof. Dr. Kaline P. Furlan

Hamburg University of Technology, Institute of Advanced Ceramics, Integrated Materials Systems Group

Abstract: The potential applications of macroporous ceramic nanostructures are several, including sensorics, catalysis, biomedicine, energy conversion, and photonics. Some of these applications require that the materials are shaped into 3D geometries not attainable by conventional fabrication processes. In this talk, I will show that combining additive manufacturing with colloidal assembly (AMCA) [1-2], followed by functionalization via atomic layer deposition (ALD) is an attractive route towards functional nanostructures. I will further demonstrate the feasibility of low-temperature ALD in combination with 3D printing for the fabrication of tailored ceramic nanostructures. Our low-temperature ALD developments reveal the possibility of homogeneously introducing dopants into zirconia [3], as well as the capability to generate dual-phase structures and even precise stoichiometric phases, such as mullite [4]. The talk will focus on photonic applications [5], but we foresee the application of such 3D printed ALD-engineered materials also in catalysis, sensors and energy conversion devices [6].

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