NEW APPROACHES TO OXIDIC NANOPARTICLES AND FUNCTIONAL MESOPOROUS CRYSTALLINE LAYERS

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Bringing nanodimensions to functional inorganic materials shows a number of promises for both basic science and applications. Solid state properties as magnetism, ferroelectricity, or optoelectronics depend on the size and can be vice-versa fine tuned by size quantization.
In this talk I will report on two novel approaches to approach such systems

1) Non aqueous sol-gel routes turned out to be a very convenient and simple way to generate stable oxidic nanoparticles even with complex composition, including Ta_2O_5, Nb_2O_5, V_2O_3, HfO_2, SnO_2, or In_2O_3, and even perovskites and spinells such as $(Ba,Sr)TiO_3$, $LiNbO_3$, and $Pb(Ti,Zr)O_3$. Details and applicability of this synthetic technique will be discussed

2) Nanocasting of organized mesophases of amphiphilic block copolymers and subsequent calcination under controlled conditions allows the generation of mesoporous thin films of crystalline oxides where both pore size and wall thickness are of the order of relevant length scales, e.g. the exiton length. It is expected that such films will be imparted in the next generation of inorganic device technology, e.g. for improved sensing or solar energy conversion.

The following pictures show two examples for such nanoproducts, on the left some ferroelectric $(Ba,Sr)TiO_3$ nanoparticles, on right some mesoporous crystalline titania films for solar cells.