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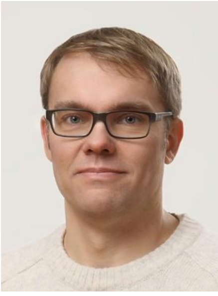

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BIOGRAPHICAL SKETCH

Dr. Jan-Henrik Smått is the leader of the Nanostructured Metal Oxide research group at the Laboratory of Molecular Science and Engineering, at Åbo Akademi University in Turku, Finland. He holds a permanent position as a senior lecturer in physical chemistry since 2012. The focus of the group lies on the design of novel nanostructured metal oxide materials using solution processing for applications in solar cells, molecular separation, and functional coatings. He has published more than 100 research papers with over 2380 citations (h-index: 25). He has been awarded two fellowships from the Academy of Finland and was recently the principal investigator in two national projects, focusing on optimizing the metal oxide charge selective contacts in perovskite solar cells. He has completed the supervision of 3 postdoctoral researchers and 5 PhD theses, and he is currently supervising three PhD students.

TITLE

Design of novel nanostructured metal oxide materials using solution processing for applications in solar cells, molecular separation, and functional coatings

ABSTRACT

The presentation will give an overview of various types of porous SiO_2 and TiO_2 materials that can be prepared by sol-gel processing combined with supramolecular templating (e.g., nanoparticles, thin films, and bulk materials). Furthermore, the nanocasting approach can be used to further replicate these structures into carbon and other metal oxides (SnO_2, In_2O_3, Co_3O_4, ZnO, etc.) with similar porosity and morphology.[1] The hierarchically structured metal oxides can be utilized in molecular separation applications (including liquid chromatography, phosphopeptide enrichment,[1] and in-tube extraction[2]) as well as in gas sensing. The selectivity towards certain chemical compounds arises from the unique acid-base properties of the metal oxides. Furthermore, sol-gel-derived metal oxides can also be utilized in many types of thin film solar cells (e.g., dye-sensitized, organic, and perovskite solar cells). For instance, the dip coating method can be used to prepare uniform TiO_2 thin films with controllable thickness and porosity for applications as charge selective layers in organic and perovskite solar cells.[3]

[1] Leitner et al. *Analyst*, **2017**, *142*, 1993–2003.
[2] Pusfitasari et al. *Journal of Chromatography Open*, **2023**, *3*, 100081.
[3] Masood et al. *Nanomaterials*, **2020**, *10*, 181.