PRESENTER INFORMATION

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BIOGRAPHICAL SKETCH

Dr. Jan M. Macak (H-index 61, > 17.000 citations) is a Senior Researcher and a group leader at the Center of Materials and Nanotechnologies of the University of Pardubice, Czech Republic and at the Central European Institute of Technology in Brno, Czech Republic. He got Ph.D. in 2008 at the Friedrich-Alexander University of Erlangen-Nuremberg, Germany. He was R&D group leader at Elmarco Ltd (2008-2010), private enterprise developing and delivering technology for synthesis of nanofibers by electrospinning. He received several prestigious awards, including Neuron Award 2015 for outstanding achievements of young scientist in the field of chemistry. Between 2015-2020 he was principal investigator of prestigious ERC Starting grant „Chromtisol“ devoted to development of solar cell based on nanotubular titania. His research is focused on the synthesis of new low-dimensional nanostructures (nanotubes, nanofibers, nanoparticles), their structure-property investigation, and the most promising materials are explored in various applications.

TITLE: Anodic TiO_2 Nanotube Layers : synthesis, properties and applications

ABSTRACT

Over the past 15 years, self-organized TiO_2 nanotube layers have attracted considerable scientific and technological interest due to their wide possible range of applications including (photo-) catalysis, hydrogen generation and biomedical uses [1,2]. The synthesis of the 1D TiO_2 nanotube layers is usually carried out by electrochemical anodization of valve Ti metal sheets in various electrolytes. The advantage of anodic TiO_2 nanotube layers compared to TiO_2 nanotubes prepared by other methods (e.g. hydrothermal) are the tunability of dimensions, their directionality, ability to absorb significant amount of incident light and the possibility to utilize nanotube interiors and exteriors for decoration-coating of secondary materials [2].

The presentation will focus on the recent progress in the TiO_2 nanotube layer synthesis. We will discuss an upscaling of the nanotube layers towards areas of dozens of cm^2 [3, 4] and the preparation of high aspect ratio layers in a short time [5], considering the control of the anodization parameters. The selective etching of anodic TiO_2 nanotube layers towards single-wall nanotube layers [6] and single nanotubes [7], where nanotubes are separated from one another into tube powders will be also discussed. Examples of magnetically guidable nanotube photocatalysts will be demonstrated [7].

[1] J. M. Macak et al., *Curr. Opin. Solid State Mater. Sci.*, **2007**, *1-2*, 3.
[2] K. Lee et al., *Chem. Rev.*, **2014**, *114*, 9385.
[3] H. Sopha et al., *Electrochem. Commun.* **2018**, *97*, 91-95.
[4] H. Sopha et al., *Applied Materials Today* **2022**, *29*, 101567.
[5] M. Alijani et al., *Electrochim. Acta* **2021**, 376, 138080.
[6] M. Motola et al., *Electrochem. Commun.*, **2018**, *97*, 1-5.
[7] D. Beketova et al., *ACS Appl. Nano Mater.* **2020**, *3*, 1553−1563.