Electrochemical Methods for the Synthesis of Nanostructured Semiconductors – Recent Advances, Challenges and Perspectives

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Among many different strategies that have been already employed for the fabrication of semiconducting oxides, electrochemical methods (both anodic and cathodic) have attracted considerable attention due to their relative simplicity, low cost, and the possibility to control (to some extent) the morphology and composition of the synthesized material by adjusting conditions applied during the procedure.

Therefore, this presentation aims to give a brief overview of our most recent achievements in the formation of various nanostructured semiconductors (e.g., SnO_2 [1–3], ZnO [4], Cu_2O [5], and others [6]) via both, anodic oxidation of metals or alloys [1, 2, 4, 6] as well as cathodic deposition [3, 5]. A special emphasis will be put on the synthesis of semiconductors with precisely designed, complex geometries at the nanoscale, strategies of modifications, properties, and possible applications, especially in photoelectrochemistry and photocatalysis.

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Fig. 1. FE-SEM images of anodically formed nanoporous SnOx with segments of different channels diameter (a, b), nanostructured ZnO film synthesized by anodic oxidation in NaOH (c, d) hierarchical SnO_x formed by anodization of Sn in NaOH (e), and ZnO nanowires obtained by anodically generated in the carbonate-based electrolyte (f).

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