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Photocathodes based on copper oxide nanostructures and their photoelectrochemical properties

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Photoelectrochemical water splitting is a promising technology to produce renewable fuels like hydrogen by using solar energy photon for the chemical reaction. Designed and controlled synthesis of nanostructures with well-defined morphology has recently gained increased attention, especially in the case of the material/liquid interface. The relationship between structure and property is one of the central issues in materials chemistry. Nevertheless, the photoelectrode material must be able to absorb sunlight efficiently and have the right band alignment. Cuprous oxide Cu_2O is a p-type semiconductor, which can be operated at relatively low temperatures. It posses high stability and good electrocatalytic characteristics. The conductivity of Cu_2O is mainly determined by the hole carrier density of the inter-granular contact region. Moreover, Cu_2O remains an attractive alternative to silicon due to the non-toxic nature, narrow band gap of about 2.0 eV, with an estimated theoretical efficiency approaching 12%. Presented work aims to fabrication and characterization of copper oxide based photocathodes for photoelectrochemical applications. Different morphologies of Cu_2-xO were synthesized by the electrochemical deposition onto a Ti foil using alkaline and acidic cupric sulfate solutions stabilized by lactate ions. The morphology of obtained materials was analyzed by SEM observation. The XRD and Raman spectroscopy measurements were carried out for phase analysis. Measurements of the photocurrent versus voltage over the UV-ViS range of the light spectrum were performed.

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Biography

A. Kusior received her MSc in a filed of materials science and Ph.D. in chemistry from AGH University of Science and Technology, Kraków, Poland in 2015. Since 2015 she has been working as Assistant at Faculty of Materials Science and Ceramics at AGH. Her scientific research concerns the physicochemical properties of nanomaterials for photoelectrochemical and sensing applications. She has published more than 15 papers in reputed journals.

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