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Flexible ZnO Nano Electrode Design for Photoelectrochemical Solar Cell Applications

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The gradual rise in the demand for alternative energy has led to the increase in the investigations performed in this area lately. Photoelectrochemical solar cells (PEC), playing a big role in renewable energy researches, are mainly used in hydrogen generation. The process is usually based on utilizing direct sunlight to produce hydrogen and is significant for its being cost effective, sustainable and environmentally friendly. Moreover, the newly upcoming trend in photo electrode designs is based on flexible substrates due to their significant advantages such as high durability, easy adaptability to compact systems, facile shaping and low weight. Our study, which focuses mainly on improvement of PEC performances in hydrogen generation, utilizes different ZnO morphologies as flexible-photoelectrode. ZnO being a representative of metal oxides has been widely used due to its wide band gap, high electron mobility and good exciton binding energy. Here microspheres with nanosheets, flower-like and nanowire morphologies of ZnO films were deposited on various substrates via facile chemical bath deposition and their PEC performances have been investigated. The photoelectrochemical performance of nanowires deposited on stainless steel foil was superior to nanowires on glass and polyimide foils. In order to determine the effect of the morphology on the PEC performance various anionic species in the precursor solution have been used. Acetate based solution resulted with the microspheres with nanosheets morphology. Conversely, flower like morphology has been observed for the nitrate based ionic source. The efficiency of the ZnO nanosheets was superior to both nanowires and flower-like structure.

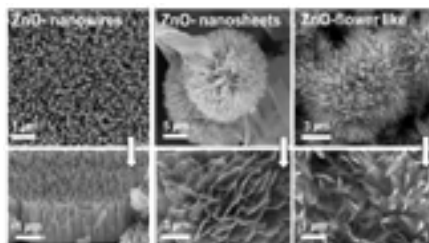


Figure 1. Various ZnO nanostructures deposited by CBD method on flexible stainless steel foil

Biography

Nazrin Abdullayeva is currently a PhD. student in the Materials Science and Nanotechnology Engineering Department at the TOBB University of Economics and Technology (TOBB ETU), Ankara, Turkey. She has graduated from the Department of Chemical Engineering of Hacettepe University, Ankara, Turkey in 2015. She has received her Master degree in Materials Science and Nanotechnology Engineering from TOBB University of Economics and Technology (TOBB ETU), Ankara, Turkey in 2017. Nazrin has carried out researches in the field of conductive polymers and ionomers, photovoltaic devices, semiconductor materials and thin film solar cell applications.

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