INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The present thesis focuses on the design and development of metal oxide based photoelectrode materials for solar-driven water splitting with tunable structural and surface properties. More precisely, the thesis work centers on the exploration of different low-cost metal oxides with bulk, interfaces and surface modifications to counter the limitations like small minority carrier diffusion length, poor charge transport properties and slow water oxidation kinetics, etc. We have used narrow band gap (2~2.5 eV) metal oxide semiconductor materials to fabricate the hybrid photoanodes for photoelectrochemical water oxidation. We have tuned the surface activities of these semiconductor metal oxides using different surface modification strategies. Various surface modification strategies such as passivation layer, active layer, hole extractor and co-catalyst are explored to modify the metal oxide photoanodes. High performances photoelectrochemical devices have been fabricated utilizing the surface modification strategies by enhancing charge carrier density, efficient electron-hole separation and water oxidation kinetics of the photoanode materials. The present method for the modification of different photoanodes with surface modifiers are simple and effective, and might provide several ways of getting stable and high-performance photoelectrodes.