Improvement of a WO_3 Photoanode by Modification with a Cobalt Oxide-Based Oxygen Evolution Catalyst

Jason Seabold and Kyoung-Shin Choi
Department of Chemistry, Purdue University

In a photoelectrochemical water splitting cell, an anode is used to produce O_2. In order to operate efficiently, the anode must be combined with an oxygen evolution catalyst (OEC) which is placed on its surface. If the anode is a semiconductor which utilizes light (photoanode) rather than a conductive material acting as a dark anode, the utilization of a catalyst becomes more complex. The effect of OEC on the energetics as well as kinetics at the semiconductor electrolyte junction, recombination of photon-induced charge carriers, and photocorrosion becomes an important factor. We studied a tungsten oxide (WO_3) photoanode and paired it with a cobalt-based OEC in order to determine the effect of the catalyst on the electrode's stability and selectivity and to understand the interactions between the WO_3 and the catalyst, including the formation of interfacial states. This study provides insight into the positive and negative aspects of semiconductor/OEC pairings which is vital if the Co-based OEC is to be operated on a photoanode as an effective catalyst.