Polyelectrolyte/Catalyst Multilayers for Solar Water Oxidation: Catalyst Loading and Surface-State Passivation of $BiVO_4$ Photoanodes

배상현, 김현우, 전다솜, 류정기†
울산과학기술원
(jryu@unist.ac.kr†)

Photoelectrochemical (PEC) water oxidation includes two key processes—separation and catalytic transfer of photogenerated charge carriers across the electrode/electrolyte interface—which determine the overall efficiency. Recent studies revealed that conventional water oxidation catalysts (WOCs) such as CoPi and NiOOH contribute to enhancing PEC performance of photoanodes primarily by improving charge separation efficiency rather than surface catalysis. In this regard, we developed a simple method to fabricate highly efficient water oxidation photoanodes by modifying their surface with polyelectrolyte and catalyst multilayers, the so-called catalytic multilayers (CMs), and we could find that CMs can effectively increase both the charge separation and catalytic efficiencies by passivation of surface recombination centers and loading of true molecular WOCs, respectively. As a result, photoanodes modified with CMs exhibited much higher performance than those with conventional WOCs. We believe that this study can provide insights to the design of novel photoelectrochemical devices.