

## Formation of Ultrathin Disorder Layer on BiVO<sub>4</sub> for Co-catalyst-free Photoelectrochemical Solar Water Splitting

조윤준, 김지원, 오철우, 박종혁<sup>†</sup>

연세대학교

(lutts@yonsei.ac.kr<sup>†</sup>)

A surface disordered layer is a plausible approach to improve the photoelectrochemical performance of TiO<sub>2</sub>. However, the formation of a crystalline disordered layer in BiVO<sub>4</sub> and its effectiveness towards photoelectrochemical water splitting has remained a big challenge. Here, we report a rapid solution process (within 5 s) that is able to form a disordered layer of a few nanometers thick on the surface of BiVO<sub>4</sub> nanoparticles using a specific solution with a controllable reducing power. The disordered layer on BiVO<sub>4</sub> alleviates charge recombination at the electrode-electrolyte interface and reduces the onset potential greatly, which in turn results in a photocurrent density of approximately 2.3 mA·cm<sup>2</sup> at 1.23 V versus the reversible hydrogen electrode (RHE). This value is 2.1 times higher than that of bare BiVO<sub>4</sub>. The enhanced photoactivity is attributed to the increased charge separation and transfer efficiencies, which resolve the intrinsic drawbacks of bare BiVO<sub>4</sub> such as the short hole diffusion length of around 100 nm and poor surface oxygen evolution reactivity.