Semiconductor Nanowires for Photoelectrochemical Water Splitting

황윤정*
KIST
(yjhwang@kist.re.kr*)

Photolysis of water with semiconductor has been investigated intensely as a clean and renewable energy resource by storing solar energy in hydrogen. Nanowires can provide several advantages for photoelectrochemical (PEC) water splitting due to their high surface areas and excellent charge transport and collection efficiency. This talk discusses various nanowire photoelectrodes, and their linked PEC cells for self-driven water splitting. Rutile TiO2 nanowire arrays are grown hydrothermally, and their charge collection and photon absorption properties are compared depending on the lengths of the nanowires. In addition, we shows that epitaxial grains of atomic layer deposition (ALD) shell on TiO2 nanowire increase the photocurrent by 1.5 times due to improved charge collection efficiency. Next, as a model system of a dual bandgap system, Si/TiO2 core/shell nanowire arrays are prepared by ALD TiO2 shell coating showing 2.5 times higher photocurrent compared to the planar Si/TiO2. These studies can represent a step towards realizing the benefit of the advanced 1D nanowire configuration for efficient solar to energy conversion.