Semiconductor Nanowires for Photoelectrochemical Water Splitting

황윤정*
KIST
(yjhwang@kist.re.kr*)

This talk presents various nanowire photoelectrodes for single or dual semiconductor systems for water splitting. Firstly, water oxidative activities of hydrothermally grown TiO2 nanowire arrays will be discussed depending on their length and atomic layer deposition (ALD) coating indicating charge collection efficiency can be improved with ALD coating. Later, the photocurrent density of the planar Si and nanowire arrays of Si coated by anatase ALD TiO2 thin film will be compared as a model system of an 1-D nanostructure dual bandgap system. n-Si/n-TiO2 heterojunction is a promising compared to p-Si/n-TiO2 junction due to bend banding at the interface. The charge separation and transport of photogenerated electrons and holes is demonstrated within a single asymmetric Si/TiO2 nanowire with kelvin probe force microscopy showing hole and electron accumulation on TiO2 side and Si side, respectively, desirable for solar water splitting. As a possible candidate for visible light absorber, TiO2 is replaced with single phase InGaN nanowire in a dual bandgap photoanode. These studies represent a step towards realizing the benefit of the advanced 1D nanowire configuration for efficient solar to energy conversion.