Fabrication of WO_3 Nanostructured thin films for Photo Water Oxidation by Aerosol Flame Deposition Method

Ding Jinrui, 윤상혁, 김교선*
강원대학교
(kkyoseon@kangwon.ac.kr*)

Tungsten oxide has been widely considered as a promising photoanode material for photoelectrochemcial (PEC) water-splitting technologies due to its intrinsic elctrochemical properties. We report a simple, fast method, aerosol flame deposition method using tungsten wire as precursor to prepare nanostructured tungsten oxide thin films. Tungsten wire is oxidized in a premixed fuel-rich flame to generate WOx vapor, which eventually deposited on the FTO glass substrate in the downstream to form $W_{18}O_{49}$ ($WO_{2.72}$). Unlike WO_3 which tends to grow as an isotropic structure, $WO_{2.72}$ has an intrinsic anisotropic growth property. By taking advantage of that, we first obtain $WO_{2.72}$ in fuel-rich premixed flame, followed by an air annealing process to convert $WO_{2.72}$ to WO_3. Thus, WO_3 thin films with nanotubes, nanoflowers aligned on FTO conductive glass were obtained. We investigated the effect of various process parameters on morphology development, such as tungsten wire feed rate, substrate temperature and deposition time, respectively. The structure properties were characterized by SEM and X-ray diffraction and the PEC properties were tested by IPCE measurement system.