Preparation and Photoelectrochemical Behavior of Nanostructured WO_3 Film with High Activity

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The ongoing energy crisis is a great challenge for the scientists and technologists in identifying and exploring the high efficiency electrodes for solar hydrogen generation by solar water splitting in photoelectrochemical cells. To design efficient photoelectrochemical cell (PEC cell), nanostructured photoelectrode should be required due to an advantages of large surface area and the fluent charge transfer. For that, we fabricated nanostructured WO_3 films using an aqueous solution with water-soluble polymer. Water-soluble polymer help to fabricate nanostrutured films, because soluble polymer not only combined metal species by electric interaction in aqueous solution and inhibited particle growth, but also acted as a binder to give a proper adhesion to substrate. The WO_3 films calcined at 550℃ was revealed to monoclinic phase by XRD patterns, indicated about 100nm particle size by SEM images. The photocurrent of 2.3mA/cm^2 (at 1.23V vs. RHE) and 3.0mA/cm^2 (at 1.8V vs. RHE) were obtained under AM 1.5G (1sun) of simulated solar illumination. The maximum IPCE of 71% was achieved at an incident wavelength of 340nm.