Photochemical Production of H_2 from Water with Hybrid Catalysts of CdS Attached to Microporous and Mesoporous Silicas under Visible Light Irradiation

의태규, 윤우석*, 김동형
(주)나노팩
(wsyoon@nano-pac.com*)

Microporous and mesoporous silicas are combined with nanoparticulate CdS particles to form hybrid photocatalysts that produce H_2 from water/ethanol solutions under visible light irradiation. Catalyst structures are characterized by XRD and SEM. All hybrid materials are active photocatalysts for water splitting, and the order of photoactivity is found to be zeolite-Y ($k = 6.6$ μmol H_2 hr^{-1}) > SBA-15($k = 2.7$ μmol H_2 hr^{-1}) > zeolite L($k = 1.7$ μmol H_2 hr^{-1}) under the same experimental conditions. Silica cavity size, which determines CdS particle size, and photocatalytic activity are found to be correlated. Photocatalytic activity is seen to decrease under acidic or basic conditions with an associated negative ionic strength effect. In addition, XPS analysis indicates loss of Cd^{2+} ion from the silicate supports occurs during the course of the photochemical reaction with apparent retention of bound CdS. We are grateful to the Hydrogen Energy R&D Center of the 21st Century Frontier Research and Development Program of the Ministry of Science and Technology of Korea for financial support.