Solar Water Splitting using Powdered Photocatalysts

Akihiko Kudo*
Department of Applied Chemistry, Tokyo University of Science
(a-kudo@rs.kagu.tus.ac.jp*)

In the present paper, we introduce various photocatalyst materials aiming at water splitting [1]. A NiO (0.2wt%)/$NaTaO_3$:La (2%) photocatalyst showed high activity for water splitting into H_2 and O_2. Many visible-light-driven photocatalysts have also been developed through band engineering by doping of metal cations, new valence formation, and by making solid solution. $BiVO_4$, $AgNbO_3$, and TiO_2 co-doped with Rh and Sb photocatalysts showed high activities for O_2 evolution in the presence of sacrificial reagent (Ag^+) under visible light irradiation. Pt/$SrTiO_3$ doped with Rh showed high activity for H_2 evolution from aqueous solutions containing a reducing reagent. Overall water splitting under visible light irradiation has been achieved by construction of a Z-scheme photocatalysis system employing the visible-light-driven photocatalysts, Ru/$SrTiO_3$:Rh for H_2 evolution and $BiVO_4$ for O_2 evolution, and an Fe^{3+} / Fe^{2+} redox couple as an electron relay. On the other hand, $AgInS_2$-$CuInS_2$-ZnS solid solution photocatalysts showed high activity for H_2 evolution from aqueous solutions including sulfur compounds as electron donors even under simulated solar light irradiation (AM-1.5).

References: [1] A. Kudo and Y. Miseki, Chem. Soc. Rev., 38 [1], 253-278 (2009).