

Photocatalytic hydrogen generation with colloidal noble metal-decorated semiconductor nanoparticles

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In my talk, I will present our recent progress in photocatalytic hydrogen generation using noble metal-decorated semiconductor nanoparticles. In particular, we study colloidal CdS nanorods decorated with Pt via photoreduction in solution.^{1,2} Nanorods decorated with sub-nm clusters exhibit hydrogen generation efficiencies up to 3.9% under UV/VIS-illumination in presence of a sacrificial hole scavenger. The observation of hydrogen generation with sub-nm cluster implies that efficient water reduction with reduced amount of Pt is possible. We further investigate the charge carrier dynamics in these systems using transient absorption pump probe spectroscopy.³ Surprisingly, we observe a slower photoelectron transfer to the catalyst under hydrogen generation conditions than in situations where no significant hydrogen generation is observed. This challenges the intuitive concept of mere optimization of electron transfer rate in order to improve overall performance.

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2. M. Berr, A. Vaneski, A. S. Susha, J. Rodríguez-Fernández, M. Döblinger, F. Jäckel, A. L. Rogach, J. Feldmann, Colloidal CdS nanorods decorated with sub-nanometer sized Pt clusters for photocatalytic hydrogen generation, *Appl. Phys. Lett.* 97 (2010) 093108.

3. M.J. Berr, A. Vaneski, C. Mauser, S. Fischbach, A.S. Susha, A.L. Rogach, F. Jäckel, J. Feldmann, submitted