

Evaluation of micro- and nanostructured nickel oxide as photocatalyst for hydrogen evolution from water

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Nickel (II) oxide (NiO) is a p-type semiconductor that has been commonly used as a co-catalyst for photocatalytic water-splitting. Here, NiO is investigated for its optical properties, electrochemical photo-onsets and photo-currents, and photocatalytic activity for hydrogen evolution in 20% aqueous methanol. Nano NiO (10 nm thick, 50-100 nm wide disks) and bulk NiO (0.05-2 m) were synthesized and platinated by photodeposition (1 mol %); the crystal structures were verified by XRD and TEM. We show that NiO is photocatalytically active for H₂ evolution from water in the presence of the electron donor methanol. Platinated nano NiO had the highest rate of oxygen evolution (162.3 umol H₂ g⁻¹ hr⁻¹), followed by nano NiO (43.1 umol H₂ g⁻¹ hr⁻¹), platinated bulk NiO (4.0 umol H₂ g⁻¹ hr⁻¹), and bulk NiO (2.0 umol H₂ g⁻¹ hr⁻¹). Overall, these findings show the first use of NiO as a water-splitting photocatalyst.