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Biography

Hsisheng Teng received BS degree in Chemical Engineering from National Cheng Kung University (TAIWAN) in 1984, and Ph.D. degree from the Division of Engineering, Brown University (USA) in 1992. He is currently a chair professor in the Department of Chemical Engineering, National Cheng Kung University. He has published more than 160 journal papers. His research interests cover mainly photocatalysis in water splitting, photoluminescence, supercapacitor, and lithium ion battery.

Graphene Oxide Quantum Dots as Photocatalysts for Hydrogen Evolution Reactions

Graphene oxide (GO) is a semiconductor that can absorb light to generate electron-hole pairs for photocatalytic reactions. GO is a suitable medium for photocatalytic reactions in an aqueous solution because it is highly dispersed in water. Our study tuned the electronic properties of GO by varying its size and the embedded functionalities. As-received GO was a p-type semiconductor. We doped nitrogen into the GO sample by ammonia treatment and converted the conductivity type. We also reduced the size of the GO sample to increase the surface area. Size modulation along with chemical modification represent a means to tune the photocatalytic activity of GO. We obtained GO quantum dots (GOQDs) that exhibited size-dependent photoluminescence emissions. Presence of nitrogen functionalities in GOQDs eliminated vacancy defect states to suppress charge recombination and resulted in the conjugation of nitrogen lone-pair electrons with the aromatic π orbitals. The Pt-deposited nitrogen-doped GOQDs effectively catalyzed H₂ evolution from a triethanolamine aqueous solution. The quantum yield for H₂ evolution reached 20 % under monochromatic irradiation at 420 nm.