

# Graphene Oxide Quantum Dots for Photoluminescence and Photocatalytic Hydrogen Evolution

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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 photoluminescent and photocatalytic activity of GO. We obtained GO quantum dots (GOQDs) that exhibited size-dependent photoluminescence emissions [1]. 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  $\pi$  orbitals [2,3]. The Pt-deposited nitrogen-doped GOQDs effectively catalyzed  $H_2$  evolution from a triethanolamine aqueous solution. The quantum yield for  $H_2$  evolution reached 20 % under monochromatic irradiation at 420 nm.

## References:

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