Photocatalyst for Water splitting

Nitrogen-Doped Graphene Oxide Quantum Dots

- This NGO-QD construction resulted in the formation of p-n type photochemical diodes.
- The n-conductivity was caused by embedding nitrogen atoms in the graphene frame, and the p-conductivity by grafting oxygen functionalities on the graphene surface.
- Visible-light illumination on NGO-QDs suspended in pure water resulted in the evolution of $\text{H}_2$ and $\text{O}_2$ at a molar ratio of approximately 2:1.

Photocatalytic Activity of NaTaO$_3$

- A sol–gel synthesis Perovskite-like monoclinic phase NaTaO$_3$ photocatalyst had indirect bandgap.
- The NaTaO$_3$ powders synthesized from a developed sol–gel (SG) method resulted in a remarkably higher photocatalytic activity than the conventional solid-state (SS) method.
- The molar ratios of $\text{H}_2$ formation were estimated to be ca. 2050 mmol h$^{-1}$ g$^{-1}$ at 400 W high-pressure mercury lamp.

Hydrogenated NaTaO$_3$ photocatalyst

- The hydrogenated NaTaO$_3$, with lower ratio of Na to Ta in structure shows that a thin layer of heterostructure was presented around the particle periphery.
- These thin layers show a variation from interior location of photocatalyst, which have irregular lattice fringes, can be attributed to the disorder surface which generated by hydrogenation.
- We collected the hydrogen as a function of time by using H$_2$Na$_{100}$TaO$_3$ photocatalyst for the mean rates of $\text{H}_2$ formation were estimated to be ca. 2300 mmol h$^{-1}$ g$^{-1}$ at 400 W high-pressure mercury lamp.

Gallic Oxydite Photocatalysts

- The GaON catalyst had band gap energies from 2.2 to 2.8 eV and showed significant activities in the visible-light promoted evolution of $\text{H}_2$, and $\text{O}_2$ gases from methanol and AgNO$_3$ solutions, respectively.
- These active catalysts had an N/O atomic ratio close to unity, suggesting that extensive hybridization of N2p and O2p orbitals promotes charge mobility, and thus enhances photocatalytic activity.

High-Quality Photoluminescence Emission

- Treating NGOQDs using submerged liquid plasma (SLP) in THF substantially enhances the QY to 15.4 % and exhibit high PL stability.
- The strong yellow-green PL emission at 530 nm excited by 470 nm wavelength.
- The PL strength remain more than 10 % QY after transfer NGOQD-THF-SLP to water for 30 days compare to the without SLP treated NGOQDs for dramatically decay.