

The international debate on Greener and selective synthesis of various aromatic amines by TiO₂ nanocatalyst under light irradiation

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Photocatalytic reduction of nitro-aromatics to industrially important amino-derivatives using greener process attracted a great deal of research interest as compared to conventional synthetic techniques. In this context, this research will show some potential usage of different sizes and shapes of bare and metal loaded TiO₂, nanostructures (1-4) for the improved photoreduction efficiency of nitroaromatics under solar irradiation. It observed that anisotropic and core-shell nanostructures displaying superior catalysis and photocatalysis properties than conventional bulk catalysts materials. Photocatalytic reduction of 25 μmol 2, 2'-dinitrobiphenyl in 50% aqueous isopropanol and 50 mg P25-TiO₂ under an argon atmosphere and 20 h UV light irradiation selectively produced 23.8 μmol of benzo [c] cinnoline (95%), (scheme 1) and 2, 2'-biphenyldiamine (5%) whose

amount gradually increased with the irradiation time beyond 20–24 h due to further reduction of benzo [c] cinnoline. Selective photoreduction of mono/di-nitro benzene to nitroaniline and diaminobenzene etc could be controlled by crystal phases and shapes of TiO₂ nanoparticles both under UV and solar irradiation. Highly sunlight photoactive Aloe-veral shaped crystalline rutile TiO₂ nanoarchitectures is found to have superior hydrogenation efficiency of different nitroaromatics than conventional P25 and rutile TiO₂ under direct sunlight exposure. Cu nanostructures of various shapes and sizes as superior catalysts for nitro-aromatic reduction and co-catalyst for Cu/TiO₂ photocatalysis. Likewise core shell and lengthy nanostructures of mono and bimetallic plasmonic nanocatalysts exhibited better selectivity and yield for nitroaromatics reduction.