

Solar Photocatalysis of Methyl Orange Using Multi-Ion Doped TiO₂ Catalysts

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Abstract : Solar-light activated titanium dioxide photocatalysts were prepared by hydrolysis of titanium (IV) isopropoxide with thiourea, followed by calcinations at 450 °C. The experiments demonstrated that methyl orange in aqueous solutions were successfully degraded under solar light using doped TiO₂. The photocatalytic oxidation of a mono azo methyl-orange dye has been investigated in multi ion doped TiO₂ and solar light. Solutions were irradiated by solar-light until high removal was achieved. It was found that there was no degradation of methyl orange in the dark and in the absence of TiO₂. Varieties of laboratory prepared TiO₂ catalysts both un-doped and doped using titanium (IV) isopropoxide and thiourea as a dopant were tested in order to compare their photoreactivity. As a result, it was found that the efficiency of the process strongly depends on the working conditions. The highest degradation rate of methyl orange was obtained at optimum dosage using commercially produced TiO₂. Our work focused on laboratory synthesized catalyst and the maximum methyl orange removal was achieved at 81% with catalyst loading of 0.04 g/L, initial pH of 3 and methyl orange concentration of 0.005 g/L using multi-ion doped catalyst. The kinetics of photocatalytic methyl orange dye stuff degradation was found to follow a pseudo-first-order rate law. The presence of the multi-ion dopant (thiourea) enhanced the photoefficiency of the titanium dioxide catalyst.

Keywords : degradation, kinetics, methyl orange, photocatalysis

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