PHOTOCATALYTIC BEHAVIOUR OF METAL DOPED TITANIUM DIOXIDE : STUDIES ON THE PHOTOSYNTHESIS OF AMMONIA ON Mg/TiO_2 CATALYST SYSTEM

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Metal ion doping of TiO_2 has been investigated as a possible way to improve the efficiency of TiO_2 catalyst for the photosplitting of water.[1] Doping the TiO_2 lattice with metal ions of different valencies has been shown to alter the catalytic properties in a significant manner.

We have studied magnesium doped TiO_2 as a photocatalyst for the photosynthesis of NH_3 from N_2 and water. The catalysts employed were prepared by firing TiO_2 in the presence of Mg^{2+} at 500°C for 2h. X-ray diffraction data and diffuse reflectance spectra indicate that of the doped catalytic up to 8% did not exhibit any titanate formation. A dopant level of about 2-4% Mg^{2+} gives optimum catalytic activity. The Mg^{2+}-TiO_2 catalysts showed ca. four fold increase in activity compared to undoped TiO_2. However in contrast to the water splitting reaction, this reaction did not show an enhancement upon coating the catalyst with Pt. At low p^H values the yield of NH_3 was higher while at high p^H values, the NH_3 yields were considerably lower with a concommitant increase in the nitrate concentration.

Doping time also influences the yield of NH_3 and the optimum firing time for photocatalytic activity was found to be ca. 2h.

Reference:

J. Kiwi and M. Gratzel, (1986) J.Phys.Chem. 90:637.