PHOTOREDUCTION OF DINITROGEN ON METAL DOPED TITANIUM DIOXIDE

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Photoreduction of N_2 to NH_3 on irradiated semiconductors has been studied as a possible means of solar enefgy conversion. Although several metal doped TiO_2catalysts have been widely studied, the yields of NH_3 obtained were too small to be of any practical significance.

It was found that ceric vanadium doped TiO_3 catalysts are far more active than the earlier reported[1] M/TiO2 systems where M = Fe, Ru, Mo, Co,, Ni. The catalytic activity was found to be depend on a number of variables in the catalyst preparation such as dopant amount, heating temperature, heating time, and pH. With ceric ion doped TiO_2 the optimum conditions were found to be, dopant amount 10% (w/w), heating temperature 250°c, heating time of 3h and a pH of 12.5. Under these conditions nearly 35 μ mol 1^{-1} of $NN_3$is obtained after 6h. With vanadium doped TiO_2 catalysts, the optimum conditions were found to be heating temperature 750°C, heating time 4h, dopant amount 10% (w/w) and pH of 3.

These values are considerably higher than those already reported in the literature which typically vary from 2-10 μ mol 1^{-1}.

These catalysts were also found to photogenerate H_2 from H_2O under non-sacrificial conditions.

References: 1. G.N. Schrauzer, T.D. Guth, J. Salehi, N. Strampach, L.N. Hui, and M.R. Palmer, Homogeneous and Photocatalysis. E. Pelizeth and N. Serpone (eds). Riedel, New York, 1986 p509.