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PHOTOCATALYTIC NITROGEN FIXATION II. ENHANCEMENT OF AMMONIA FORMATION UPON COATING SEMICONDUCTORS WITH NOBLE METALS

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The metal ion doped modifications of TiO_2 are active catalysts for the photochemical synthesis of ammonia from nitrogen and water[1]. It has been reported that iron doping gives the highest yields of ammonia on TiO_2 while a mixed oxide catalyst $NiO\text{-}SrTiO_3.RuO_2$ is reported to have even a higher activity[2].

In a continuing search for better photocatalysts for the fixation of nitrogen, the effect of coating semiconductors with various metals on the yield of ammonia was studied. Noble metals such as platinum, silver and mercury were deposited on $SrTio_3$ particles by irradiation in the presence of a soluble salt of the noble metal. The metallized powders were irradiated under a slow stream of nitrogen and the resultant NH_3 formed was determined colorimetrically. It was found that the activity of the metallized powders increases from Hg > Pt > Ag. The results also show that coating with a particular noble metal is more efficient than doping the lattice with the same metal ion in the case of TiO_2 catalysts. It was also observed that the yield of ammonia increases to a maximum after about 1 h of irradiation and decreases thereafter with time.

References

1. Schrauzer, G.N. and Guth, T.D. (1977) J. Amer. Chem. Soc. 99 7189.

2. Li, Q.S. et al (1983) Chem. Lett. 321.