PHOTOCATALYTIC REDUCTION OF MOLECULAR NITROGEN ON METAL-SUPPORTED TITANIUM DIOXIDE

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Photocatalytic synthesis of ammonia from dinitrogen and water over metal/TiO_2-based catalyst was investigated. All the photocatalytic reactions were achieved by a 400W medium-pressure mercury arc lamp under a slow stream of purified nitrogen at room temperature.

During a period of five months several systems were studied:

1. Cerium/TiO_2-based catalysts. It was demonstrated that the yield of ammonia formation was much higher with cerium-doped TiO_2 compared to the other metal-doped TiO_2 catalysts reported. Ce(IV) was more active than Ce(III) and out of the cerric compounds used (sulphate, hydroxide, and oxide) $Ce(SO_4)_2$-supported catalyst had the highest activity. The preparation procedure of the doped catalyst also affected the catalytic activity. The optimum conditions for nitrogen reduction were as follows: amount of dopant was 10 percent of cerric by mole, optimum firing temperature was 250° C for three hours, and maximum pH of the medium was 12.5.
2. V_2O_5/TiO_2-based catalysts.
3. TiO_2-supported lanthanum elements such as Eu, Er, Gd, Dy, Sm, Tb, Nb, and Pr.

The second and third systems are still under investigation.