

PHOTOCATALYTIC NITROGEN FIXATION  
I. OBSERVATION OF OXIDATIVE NITROGEN FIXATION  
ON HYDROUS FERRIC OXIDE

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Photocatalytic nitrogen fixation has received considerable attention in recent years. Schrauzer & Guth<sup>1</sup> first reported the photochemical synthesis of ammonia on various metal doped TiO<sub>2</sub> catalysts. Although there have been several reports of photochemical synthesis of ammonia on illuminated semiconductor catalysts and their doped modifications the yields of NH<sub>3</sub> are very small<sup>2,3</sup>. It was also observed that the yield of ammonia reaches a maximum, generally after about 1 h of irradiation and rapidly decreases with time thereafter. The loss of photocatalytic activity has been attributed to catalyst poisoning and due to photodecomposition of NH<sub>3</sub>.

We have observed that hydrous ferric oxide is an efficient photocatalyst for the synthesis of ammonia. A suspension of the hydrous ferric oxide or its modifications when irradiated using a mercury lamp under a slow stream of nitrogen produced ammonia and nitrate. The yield of ammonia reached a maximum after 1 h of irradiation and decreased with time afterwards. In addition to ammonia we find that nitrate is also formed during the irradiation which increases with time. This is the first example of an oxidative nitrogen fixation reaction on an illuminated photocatalyst. The observed variation of the nitrate formed with time partly explains the decrease in the yield of NH<sub>3</sub> with time.

#### References

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