

Electrocatalytic Nitrogen Reduction Reaction on Niobium nitrides under ambient conditions

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The Haber-Bosch process is the dominant industrial reaction to produce ammonia, which enabled mass-production of ammonia fertilizer contributing abrupt human population growth. However, Haber-Bosch process generates massive amount of CO₂ gas (1.7million tons per year) occupying more than 1% of global energy consumption. To substitute this method, electrocatalytic nitrogen reduction reaction (NRR) is actively researched these days, which is eco-friendly and less energy consuming. However, current catalysts for NRR have still low faradaic efficiency and ammonia production rate. Among the various candidates, transition metal nitrides (TMN) are expected to have high NRR activity due to their unique Mars-van Krevelen mechanism. In this study, NbN catalysts are synthesized by urea-glass route and their electrochemical tests for NRR are conducted by CV, LSV, and Chronoamperometry in 0.1M KOH solution. Also, produced ammonia is detected and quantified by UV-vis spectroscopy using the Indophenol method.