

GREEN AMMONIA ELECTROSYNTHESIS IN AQUEOUS ELECTROLYTE: A PRELIMINARY STUDY

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Due to a potential energy crisis and the continuously increasing environmental problems, research has focused on ammonia (NH₃) as a promising alternative renewable energy carrier and storage intermediate for global use in the future is gaining momentum.¹⁻³ Electrochemical nitrogen (N₂) reduction reaction (E-NRR) is a suitable technology widely recognised as an alternative option to the extremely energetically demanding Haber-Bosch process (HBP). The main challenges of E-NRR in aqueous electrolytes is the optimization of the system to suppress the process competing hydrogen evolution reaction (HER). At present, most of works employ a H-type cell, however the

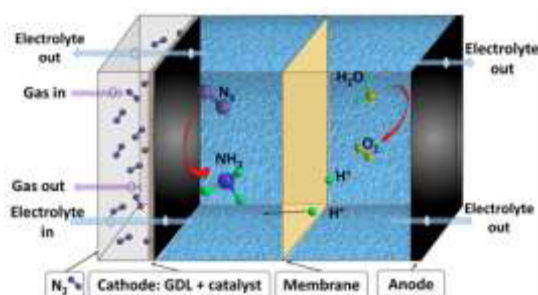


Fig. 2 Scheme of the flow cell equipped with a gas-diffusion electrode.

flow cell reactor with a gas-diffusion electrode (FC-GDE) shows clear advantages as it reduces mass transfer limitations due to low N₂ solubility and allows efficient and quick NH₃ remove.

The aim of the present work is to gain further insight into the activity and stability of a commercial molybdenum disulfide catalyst (MoS₂) combined with different formulated electrolytes (LiSO₄, LiClO₄ and K₂SO₄ at different concentration and pH). All the experiments have been

performed in a FC-GDE (Fig. 1) on which the catalyst is immobilized through air-brushing technique. Promising results have been obtained when employing Li⁺ as a cation in the electrolyte since it can promote MoS₂ NRR activity thanks to the modification of the crystalline structure after Li⁺ ions intercalation.⁴ The studied catalyst/electrolyte combination made it possible to obtain Faradaic efficiencies between 5 and 10%, and 85-301 μmol g⁻¹ h⁻¹ yield at -0.6 V vs. RHE. With these promising results, further experiments are being carried out to find the optimum electrolyte concentration and pH, potential and gas and liquid flow rate.

References

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