Overview

**Project Vision**
The project aims to design and implement advanced components (e.g., catalyst and membrane) to transform the efficiency of electrochemical synthesis of ammonia (ESA) using air, water and renewable energy.

**Project Impact**
The proposed project is anticipated to significantly increase the efficiency of ESA at an appreciable current density. It may ultimately lead to the reduction of ammonia production cost by 30% compared to conventional Haber-Bosch process.

Innovation
- High-performance selective catalysts to boost ammonia synthesis while inhibiting hydrogen evolution
- Durable high-temperature alkaline membranes (>100 °C) to promote the ammonia production reaction
- State-of-the-art electrolyzer cell design to maximize the ammonia production efficiency

**NH3 detection: Ion Chromatography**

Renewable Energy installations increase tremendously over past 20 years

- Conversion of renewable electricity during off-peak hours causes grid interruption

**Catalysts**

- KOH is more favorable over NaOH for the NRR during the NH3 synthesis
- Introduction of Fe doping compromises the NRR activity, leading to reduced production rates

**Synthesis of nanoporous and highly disordered carbon from ZIF-8**

- Membranes

- Electrolyte Effect

- Fe doping Effect

**Accomplishments**

- Converting renewable energy to fuels or using air, water or wastes

**NH3 detection**

- Ion Chromatography

- Energy storage comparison

- 6 x

- 40 x

**Summary**

- State-of-the-Art

- Proposed

- Faradaic efficiency

- Current Density (mA/cm²)

- Ammonia production rate (mol/cm²)

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**Tech-to-Market strategy**
- Long-term focus: automotive sector as liquid hydrogen carrier
- 1st market: Wind power; 2nd market: Liquid fertilizers
- Licensing / partnership with renewable farms and distributed fertilizer plants