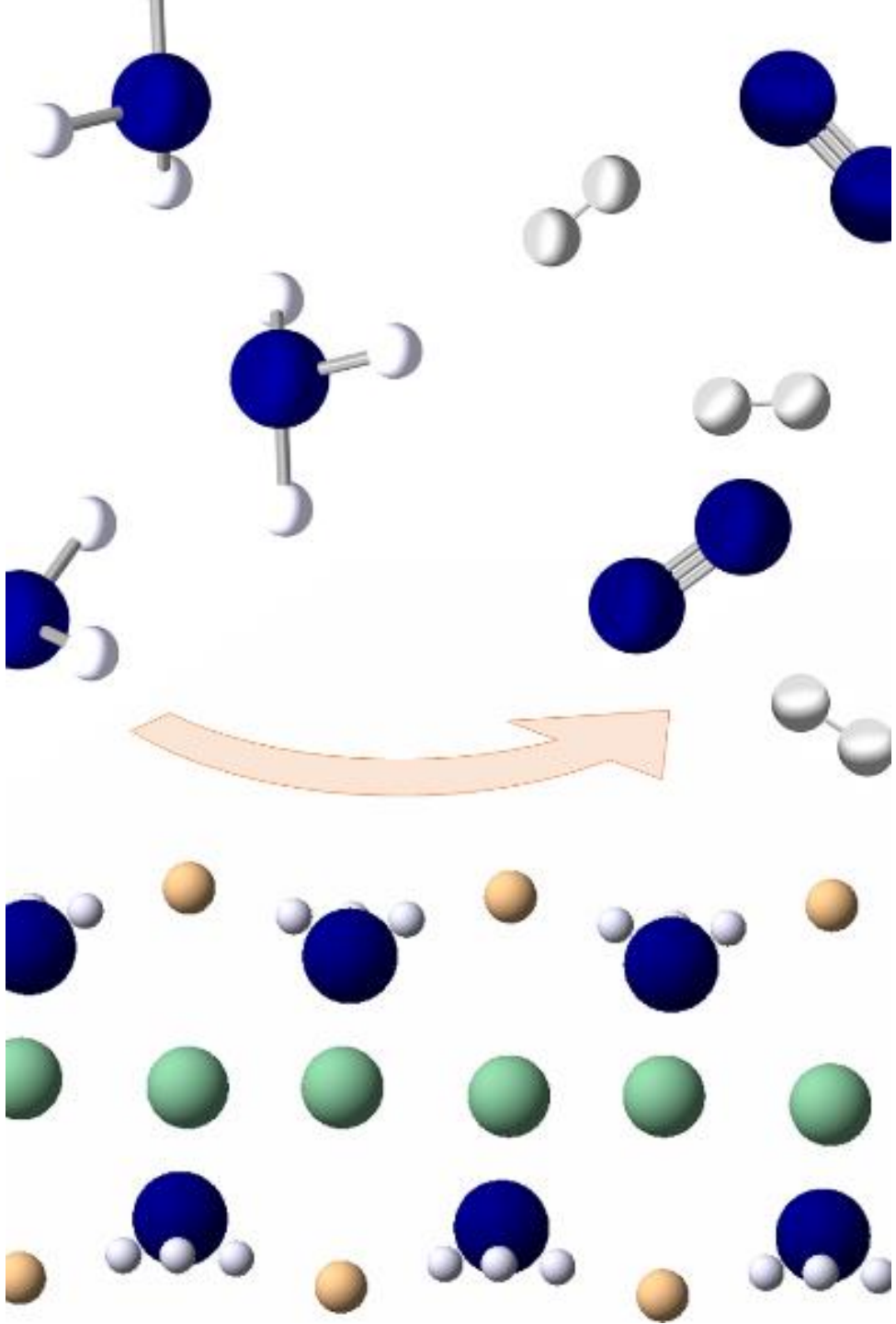


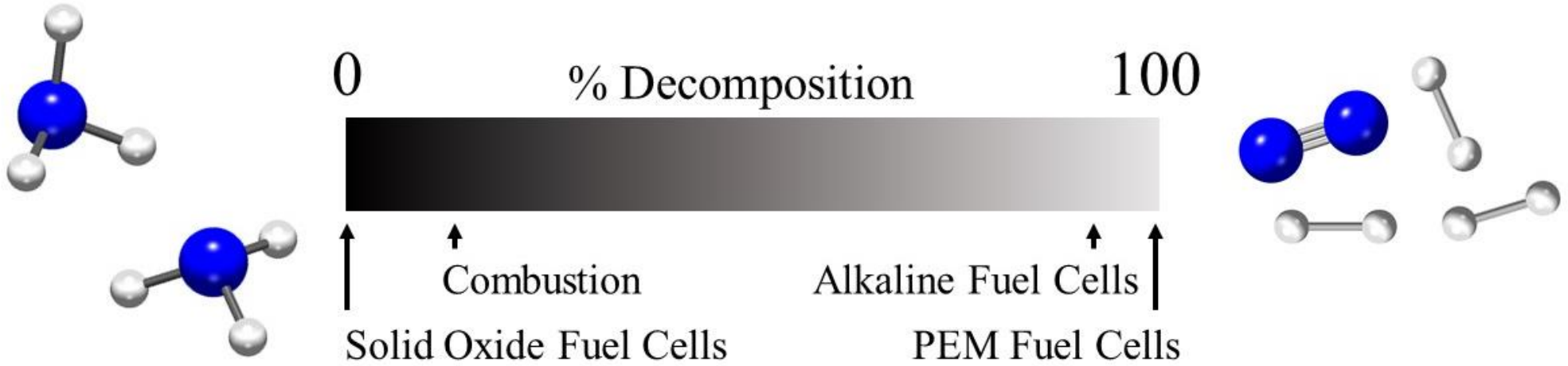
Ammonia cracking: when, how, and how much?

Dr Josh Makepeace
UKRI Future Leaders Fellow, Lecturer in Materials Chemistry

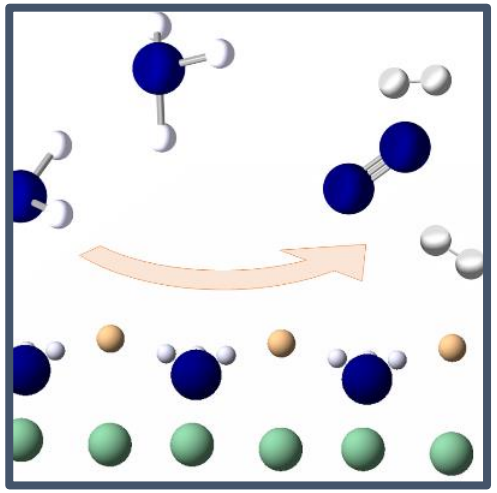
UNIVERSITY OF BIRMINGHAM

17th Ammonia Energy Conference

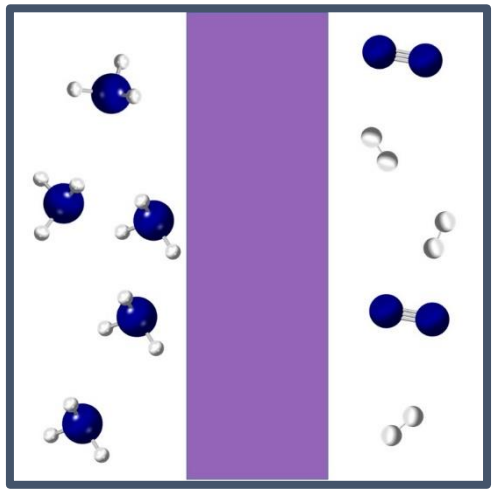
Ammonia cracking: unlocking flexible electricity generation



Ammonia cracking approaches:

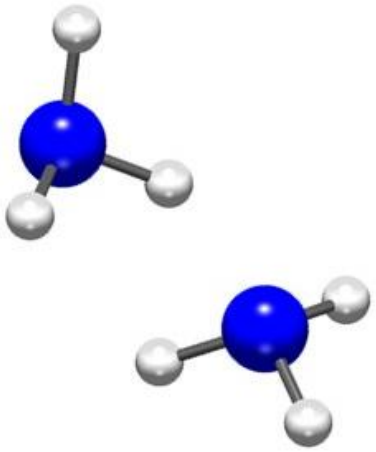


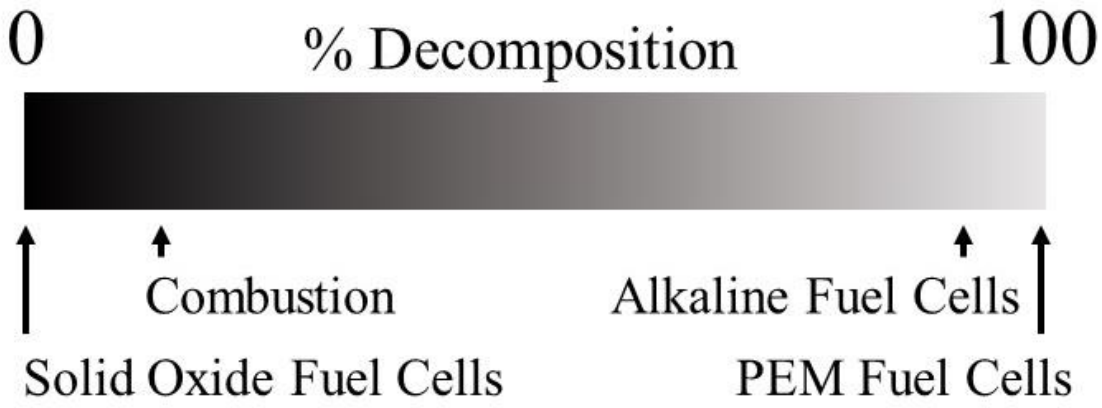
Heterogeneous catalysis

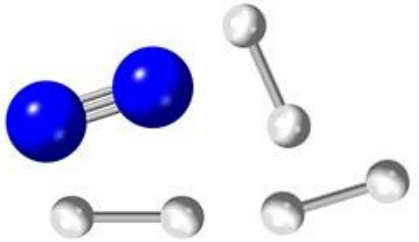


Plasma decomposition

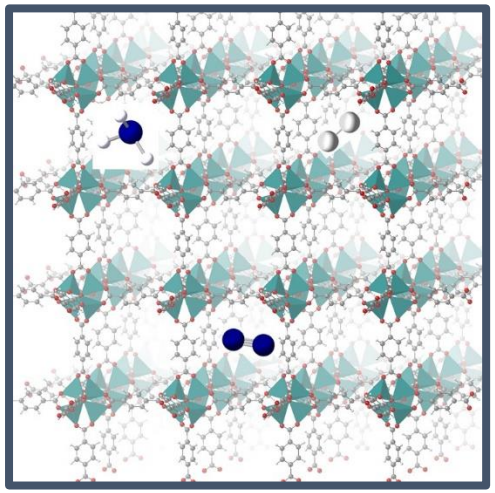
Ammonia cracking: unlocking flexible electricity generation



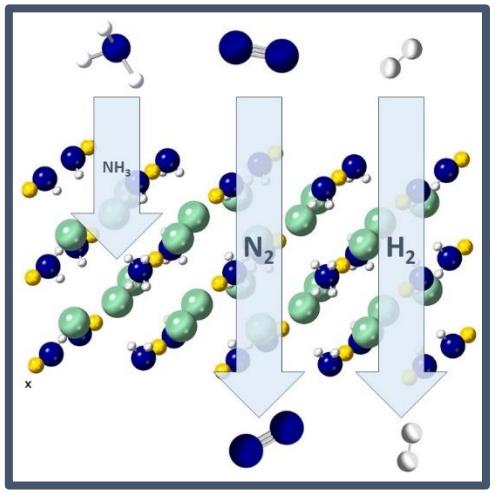




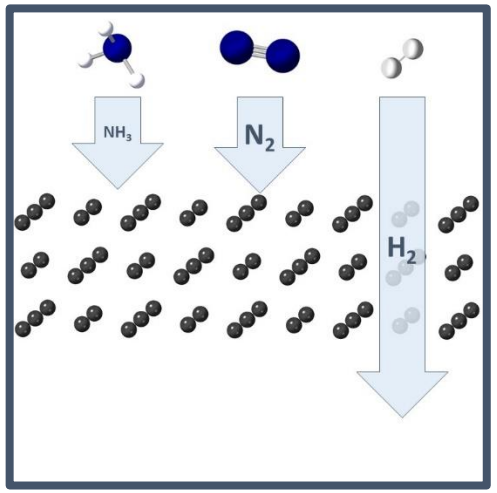
Gas purification approaches:



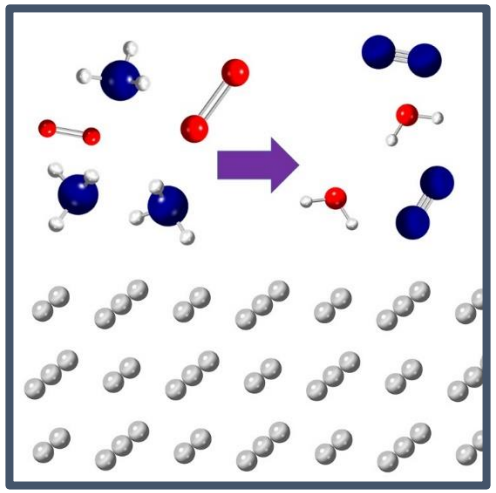
Pressure-swing adsorption



Sorbents

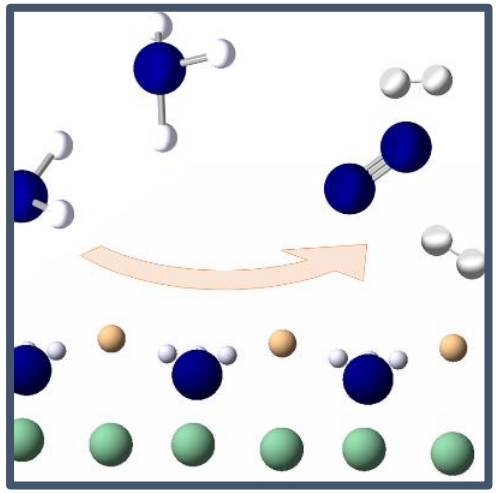


Membranes

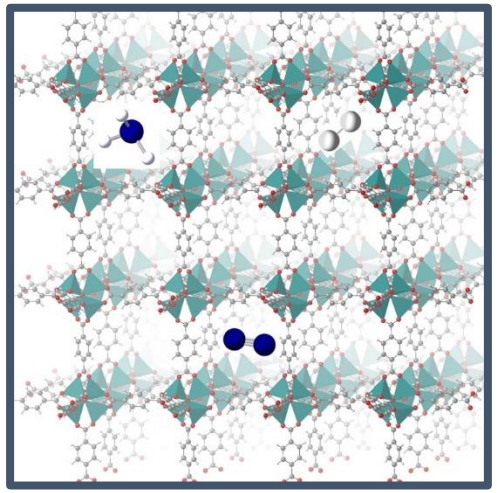


Catalytic oxidation

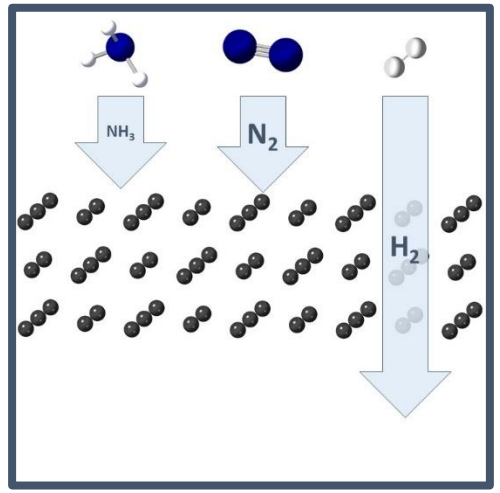
Commercially available crackers



Heterogeneous catalysis



P/T-swing adsorption



Membranes

- Provision of reducing atmosphere for metallurgy
- Operating temperature: 850–1000°C
- Low pressure hydrogen
- Residual ammonia: <30ppm, residual N_2: up to 25%
- 1–1500kg H_2/day
- Electrical efficiency ~ 30–60%

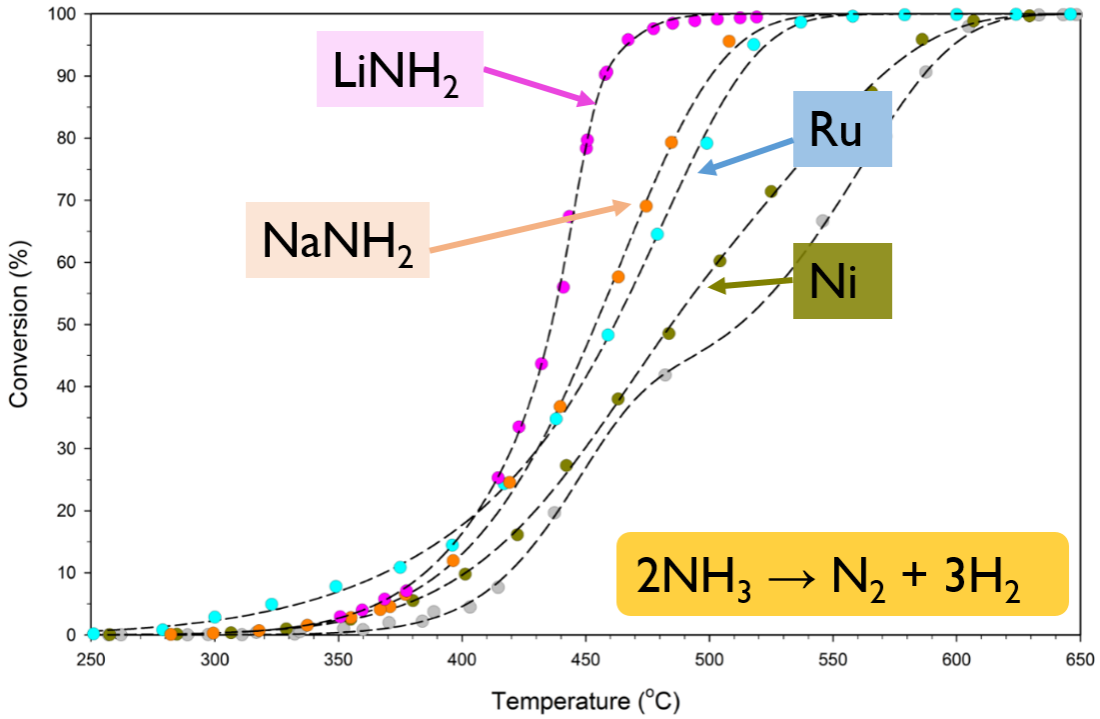
Future directions and key questions

Catalysts

- Significant ongoing catalyst optimisation research (catalysts, supports, promoters)
- How does the application dictate the requirements of the catalyst?
- Catalyst and reactor/system design for maximising conversion, heat transfer and efficiency

Purification

- Where is the balance between purity, recovery and cost for each application?
- Cheap and robust ammonia scrubbing systems



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What is the cost?
per kg H_2 / kWh

Ammonia cracking and purification: Technical Briefing

AMMONIA ENERGY ASSOCIATION

Aim: To provide a key resource for techno-economic details of ammonia cracking and hydrogen purification technologies

- Outlining the potential for ammonia cracking to contribute to sustainable energy goals
- Summarising key concepts and technology
- Identifying key areas needing further development
- Research areas → early-stage technology → near-commercial → commercial
- Highlighting demonstration projects

What would you like to see in the report?