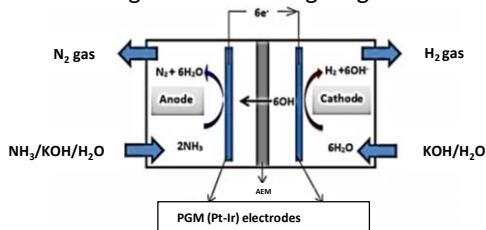


Technology background

HySA Infrastructure has fully commissioned and validated ammonia (NH_3) electrolyser system, developed by Ohio University in the USA. This system can be used for purification of ammonia effluents while simultaneously generating hydrogen. The ammonia process is much less energy intensive than water electrolysis, requiring 1.55 W-h/g H_2 , compared to 33 W-h/g H_2 for water electrolysis. The electrolyser utilises PGM (Pt-Ir) catalysts and that meets DST requirement for PGM beneficiation. In future, this technology can be industrialised to use ammonia from livestock and municipal waste water as feed-stocks to generate power.

Operating principle

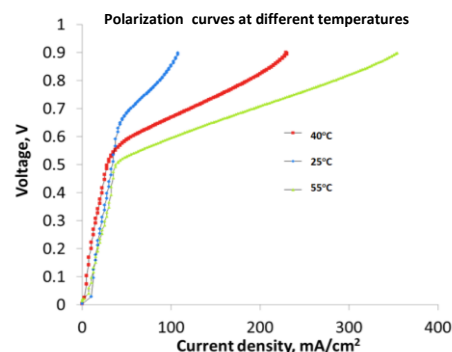
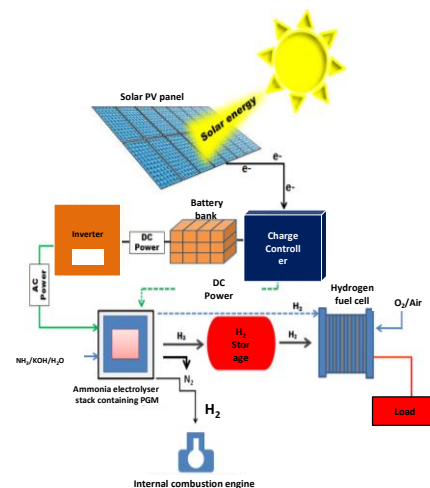
Ammonia in 5 molar potassium hydroxide (KOH) solution at 55 °C is fed into the electrolyser. A voltage of 0.900 V is then applied across the stack to drive the electro-chemical reactions. As a result, H_2 and N_2 are produced and ammonia is consumed according to the following diagram.



Advantages of ammonia electrolysis

- ❖ Low operating temperature about 60°C maximum.
- ❖ Could operate with proton exchange membrane (PEM) fuel cells as a power source.
- ❖ Easy to operate with renewable energy sources (solar and wind energy)
- ❖ Hydrogen is produced on demand and the infrastructure for ammonia distribution and storage is already available.
- ❖ Hydrogen gas purity is compatible with PEM fuel cell (< 0.1ppm ammonia).

System integration



High performance ammonia ion selective electrode (ISE).



From left: Recirculating chiller/ heater, SRI-8610 C gas chromatography, ammonia electrolyser setup.



Creating opportunities from South Africa's mineral wealth