

Electrocatalytic synthesis of ammonia from water and nitrogen using an oxygen-ion conducting electrolytes.

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Ammonia has been recognized as a carbon-free fuel which can be applied to the current energy systems including vehicle, gas turbine, fuel cells, etc. Ammonia contains 17.6 wt% of hydrogen and has significant advantages over hydrogen in storing and transporting energy. The current industrial ammonia production (i.e. Harbor-Bosch process) is an energy-intensive process (over 30 GJ/ton NH<sub>3</sub>) operating at high pressure (150–300 bar) and high temperature (450–600°C). It also requires hydrogen produced by steam reforming of natural gas or coal gasification resulting in high greenhouse gas emission (2.16 kgCO<sub>2</sub>/kgNH<sub>3</sub>). In order to lower the energy consumption and reduce the greenhouse gas emission, an alternative process is the electrocatalytic synthesis of ammonia from water and nitrogen.

In the present contribution, electrocatalytic synthesis of ammonia from water and nitrogen was experimentally investigated using an oxygen-ion conducting electrolytes. The effects of temperature and applied current on the ammonia formation rate were discussed.