Direct Ammonia Derivative Fuel Cell (DADFC)

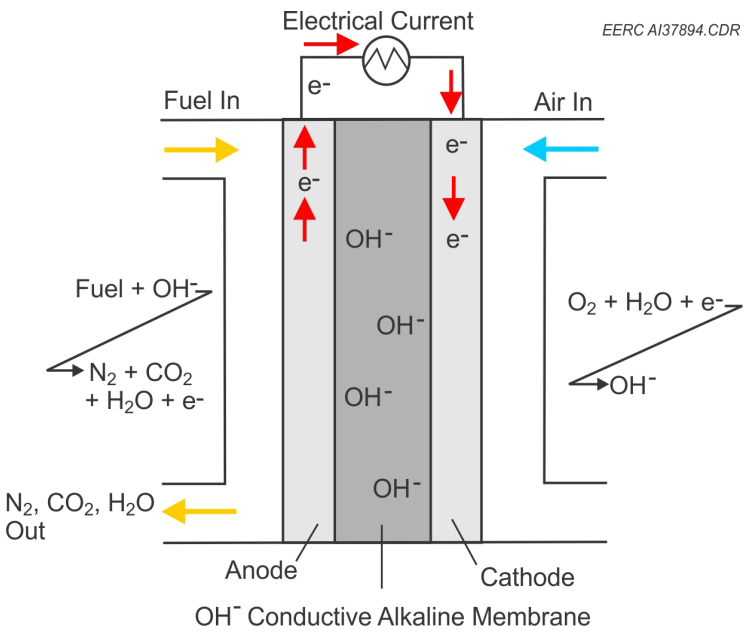
Non-Hydrogen-Requiring Alternative to PEMFC

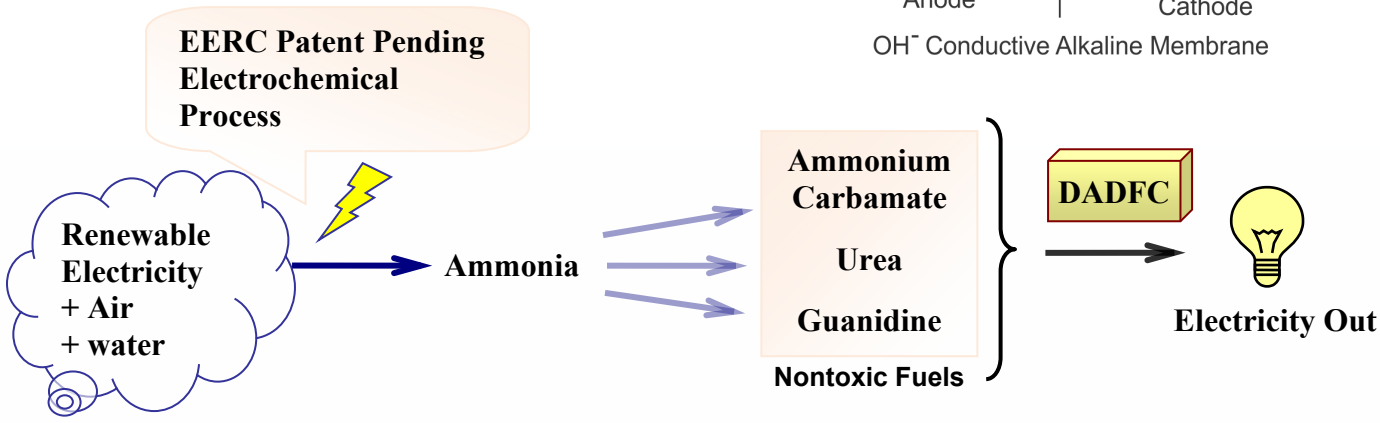
Perfect Fit into Ammonia-Based Economy

Safe, Nontoxic, Nonflammable Fuels

Fuels Currently under Development

- Ammonia (NH_3)
- Ammonium Carbamate (NH_2COONH_4)
- Urea ($CO(NH_2)_2$)
- Guanidine (NH_2CNHNH_2)





EERC Current Research Is Focused On:

- Developing new types of polymer membranes and polymer–electrode interfaces.
- Improving ionic conductivity.
- Increasing chemical and thermal stability.
- New grafted block copolymers of electron-conducting and anion-exchange polymers.

Benefits:

- Low-cost metal composite electrodes, no need for platinum.
- High energy efficiency, high power density.
- Operational temperature range of 80°–150°C is ideal for transportation applications, enables quick start-up.

Economic and Environmental Impacts

- Assuming availability of enough DADFC vehicles, the electrolytic ammonia production capacity of the combined North Dakota, Texas, and Kansas annual wind energy resource could replace 90% of total U.S. annual gasoline consumption at a projected cost of $0.90–$1.35 per gasoline-gallon-equivalent.
- Up to 20% reduction of total U.S. annual CO_2 emission achievable because of substitution of gasoline with renewable ammonia derivatives.

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