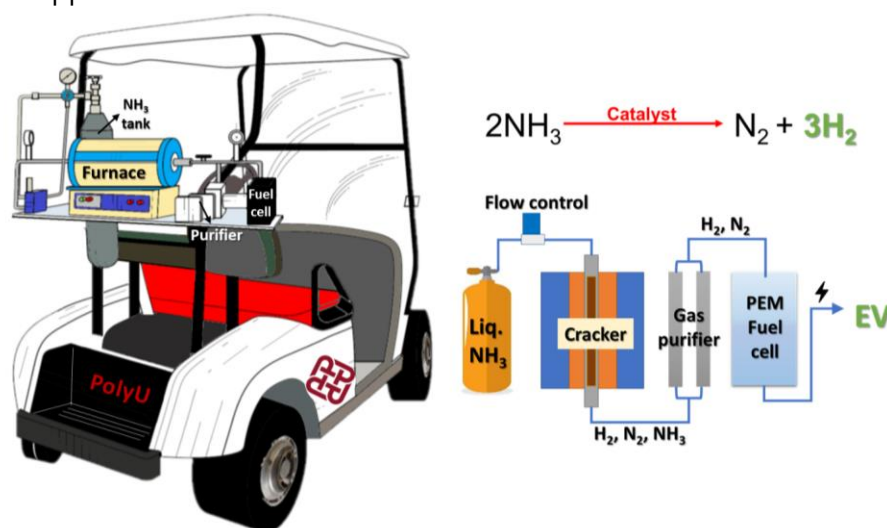


From Lab to Practical: An ammonia-powered Fuel Cell Electric Golf Cart System

Ammonia (NH₃) is a carbon-free hydrogen (H₂) carrier, which enables liquid-phase H₂ storage and transport under mild conditions. Although the concept of NH₃-to-H₂ has been frequently proposed, the practical application of NH₃ as the energy source for H₂ power automotive systems is rarely reported. To close the gap between NH₃ supply and H₂ utilization, we demonstrated an NH₃-powered fuel cell electric golf cart as a proof of concept. The integration of NH₃ cracker (installed with catalyst), gas purifier, fuel cell, and energy management system formed a successful powertrain that could thrust a golf cart into motion. The catalytic performance of both nickel (Ni) and iron (Fe)-based catalysts was measured (cracker gas evolution monitored by HPR-20 EGA, Hiden), and the optimal catalyst demonstrated a > 99.9% NH₃ conversion at 600 °C. The gas purifier was confirmed to be capable of removing the residual NH₃ for a proton exchange membrane fuel cell (PEMFC). The fuel cell, when powered by the cracked and purified gas mixture, revealed comparable performance and power output as compared with the pre-mixed fuel gas mixture (75%H₂/25%N₂), demonstrating the feasibility of the whole system. The demonstrated NH₃-powered fuel cell prototype with an energy level of 17.5 kWh gives total system-specific energy of 379.4 Wh/kg. When equipped with 15 kg NH₃, the integrated power system is expected to meet the US Department of Energy's 2020 gravimetric hydrogen capacity target for onboard automotive hydrogen storage systems. During the operation, only N₂ and water are generated in the chemical processes of the system and emitted into the atmosphere, demonstrating that this power-generating technology is clean and carbon-free. Our proof-of-concept prototype represents an innovative demonstration of the NH₃-powered fuel cell vehicle system, giving rise to a future reference and inspiration for the practical developments of NH₃-based H₂ fuel applications.



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Hidden Product: [HPR-20 EGA](#)