

### A hybrid adsorbent-membrane reactor (HAMR) system for hydrogen production

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We investigate a HAMR system involving a hybrid-type packed-bed catalytic membrane reactor coupling the methane steam reforming reaction through a nanoporous SiC membrane with a CO<sub>2</sub> adsorption system. This HAMR system is of potential interest to pure hydrogen production for PEM fuel-cells for various mobile and stationary applications. The reactor characteristics have been investigated for a range of temperatures and pressure conditions relevant to the aforementioned applications, and are compared with the behavior of the traditional packed-bed reactor, a conventional membrane reactor, and an adsorptive reactor. The HAMR outperforms all the other more conventional reactor systems. It shows enhanced methane conversion and hydrogen yield, and product purity, and provides good promise for reducing the hostile operating conditions of conventional methane-steam reformers, and for meeting the product purity requirements for PEM operation. Optimization aspects and economics of such reactors will be discussed at the meeting.