

**A novel hybrid adsorbent–membrane reactor (HAMR) system for hydrogen production
undergoing
methane–steam reforming**

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A novel hybrid adsorbent–membrane reactor (HAMR), has been investigated for hydrogen production using CO₂ adsorption system. The HAMR couples reactions, i.e. methane–steam reforming, esterification, and membrane separations for byproducts, i.e. CO₂, H₂O, with adsorption on the membrane feed–side or permeate–side. Performance of conventional reactors has been greatly improved by this integrated system. This HAMR system is of potential interest to pure hydrogen production for fuel cells in various mobile and stationary applications. The HAMR system shows enhanced methane conversion, hydrogen yield, and product purity, and provides good promise for reducing the hostile operating conditions of conventional reformers, and for meeting the product purity requirements.