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Abstract

In the present work, the feasibility of producing and simultaneously separating hydrogen from coal steam gasification (CSG) in a protonic ceramic membrane reactor (PCMR) is demonstrated. A Cu/BZCY81/Ni-BZCY72 tubular cell was employed as the PCMR for the studies. Saturated steam was fed over a mixture of powdered carbon black and K_2CO_3 gasification catalyst, which was in contact with the Cu anode. At 600 to 700 ^oC, the electrochemical separation of generated H_2 from the gasification chamber (anode) was found to enhance the reaction rate to H_2 and CO_2 by up to 60%. This novel approach to the steam gasification of carbon holds promise for the production of high purity H_2 from coal- or biomass-based electrochemical processes at much lower operation temperatures, compared to the conventional thermochemical methods.

Graphical Abstract