

The study on the performance of water gas shift reaction using fluidized bed membrane reactor

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Palladium based membranes, which are permselective to hydrogen separation, were used for the hydrogen purification for improving conversions by shifting the reaction equilibrium. In this studies, the enhancement effect of H<sub>2</sub> production and separation was investigated by adopting the Pd-membrane at the top of the fluidized-bed WGS reactor. At the preliminary test, the separation capability of H<sub>2</sub>(Pure), binary mixtures of H<sub>2</sub>/CO<sub>2</sub>(60/40%) and a ternary mixture of H<sub>2</sub>/CO/CO<sub>2</sub> (40/40/20%) was measured with the composite membrane at 300 oC and 2~3 bar. As a result, H<sub>2</sub> permeation inhibition was observed due to the presence of both CO and CO<sub>2</sub> in the mixtures. The operation conditions of WGS/membrane hybrid system were 250~400 oC and 2~3 bar, H<sub>2</sub>O/Carbon(S/C) ratios were between 1 and 2.5. A maximum CO conversion of 94.5 % was achieved at S/C=2.5, 300 oC and 2.5 bar. CO conversion using Pd based membrane reactor at an appropriate condition was over 10~15 % greater than that without the membrane reactor.