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Pd-alloy supported membranes: Hydrogen separation/purification and membrane reactor applications

Adolfo Iulianelli, Giuseppe Bagnato and Angelo Basile
CNR-ITM, Italy

The main industrial process for producing hydrogen is represented by the natural gas reforming, which consists of a multi-step process in which the steam methane reforming takes place in harsh conditions (800-1000 °C and 15-20 bar), followed by two water gas shift reactors and other separation/purification stages for producing high purity hydrogen. However, the natural gas composition of the feeding stream can vary widely from source to source, but each of them contains some traces of H₂S. This can damage dramatically the permeation characteristics of the Pd-based membrane and, consequently, affect the overall performance of the membrane reactor. In the last years, many authors studied the preparation of composite membrane based on Pd alloyed with other metals, such as Au, Ag, Pt or Cu, responsible of higher resistance to sulfur contamination. In this study, a composite membrane constituted of a thin layer of Pd-Au supported on porous supports has been fabricated for their utilization in hydrogen separation field. For comparison, a supported pure Pd-membrane has been also studied in order to compare the performance under long-time operation of the different membranes and for evaluating the H₂S effects on both systems. They have been also used in membrane reactors to carry out steam methane reforming reaction, by comparing the experimental results with an equivalent conventional reactor.

Biography

Adolfo Iulianelli has completed his Degree in Chemical Engineering and PhD in Chemical and Material Engineering. Presently, he works at the Institute on Membrane Technology of the Italian National Research Council. He has published more than 50 articles in international scientific ISI journals, more than 20 chapters in international books, author of one patent and a book and of more than 50 papers in proceedings of national and international conferences. He is a Reviewer of more than 20 scientific ISI journals, Associate Editor of *International Journal of Membrane Science & Technology*, Editor of *Journal of Membrane Science and Technology*, *Advances in Chemical Engineering and Process Technology*, *Journal of Fuels and Scientific World* as well as serving as Guest Editor for *International Journal of Hydrogen Energy*.

adolfoiulianelli@yahoo.it

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