

Emerging Ceramic Membrane Technology

A Business Opportunity

The CANMET Energy Technology Centre (CETC) has achieved significant advances in ceramic membrane technology and its application. We believe we have “breakthrough” technology that has great potential for commercialization in Canada. CETC is proud to offer this technology and its know-how to Canadian industrial partners for further commercial development.



CETC's Membrane Testing Facilities

Opportunity

Ultimate Product Interest

The hydrogen-permselective membrane will ultimately be of interest to synthesis gas producers for Fischer-Tropsch synthesis and methanol production, for hydrogen production for fuel cells and to industries involved in hydrocarbon production. Membrane reactors offer a new industrial paradigm as they combine reaction and separation in one step. Although this technology is not in use commercially, it has potential for enhancing several processes.

Immediate Product Interest

The membrane substrate will be of immediate interest to research institutes who conduct research in perfecting membranes or membrane reactors for application in the above mentioned industrial processes.

Immediate Technology Interest

The CETC ceramic membrane technology will be of interest to ceramic membrane manufacturers. Initially, they will be able to supply research institutes to take the above concepts to pre-commercial status.

With commercial success, this technology will open up an entire new market for ceramics in the area of industrial production of synthesis gas, hydrogen and hydrocarbon processing.

CETC's Expertise and Technology

CETC's experience will give industrial partners a unique advantage in further developing ceramic membrane technology.

Processing and Environmental Catalysis

The know-how consists of proprietary information on:

- manufacturing uniform and stable asymmetric α -alumina membrane substrates
- synthesis by chemical vapour deposition (CVD) of silica hydrogen-permselective membrane

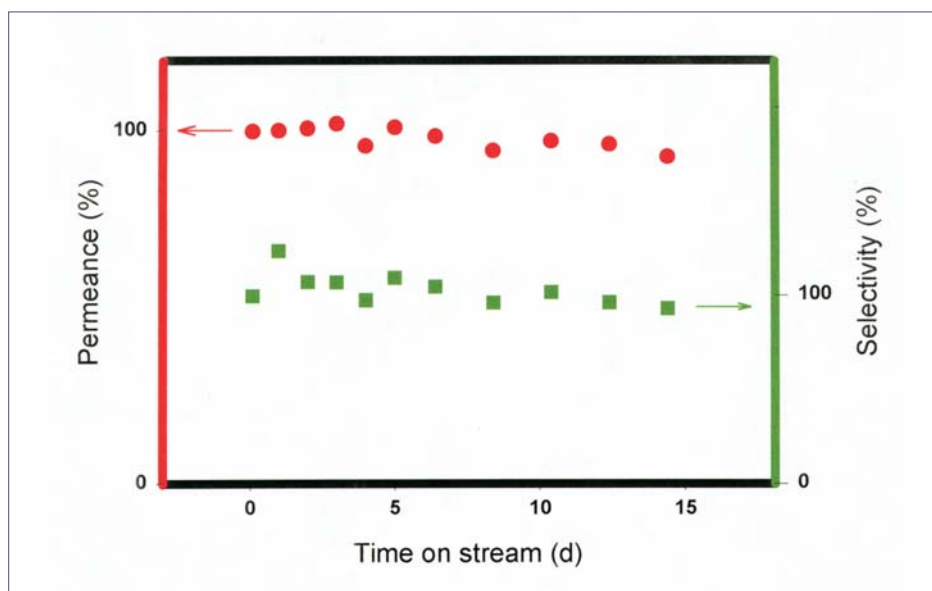
Challenges

Industrial reactors require membranes that assure high, selective flux of the desired product. This can only be achieved with an extremely thin membrane, free of cracks and pinholes.

The membrane should be thermally stable and chemically resistant to prolonged operation at high temperatures including thermal cycling. Mechanical strength is needed for integration into industrial operation.

CETC's Technology Success

Our success in this high risk R&D was based on strong support and collaboration of companies participating in the Consortium on the Conversion of Natural Gas (CCNG). CCNG is managed by CETC and partly funded by the federal Program on Energy Research and Development (PERD).



Results of 400 h stability test for Ceramic Hydrogen-permselective Membrane

CETC's membrane program yielded the world's "best" hydrogen permselective ceramic membrane compared with available literature. Also, new insights and new mechanisms were identified governing chemical vapour deposition in the complex geometry of multi-layer porous materials. Since quality ceramic substrates were unattainable from commercial suppliers, CETC produced its own asymmetric ceramic substrates. In the process, key parameters controlling the quality of

α -alumina coating of base tubes were identified. CETC believes these successes constitute a breakthrough in the production of high performance hydrogen-permselective membranes for a variety of applications.

CETC developed and patented a novel technology that converts natural gas to syngas by catalytic partial oxidation or dry reforming (CH_4 reforming with CO_2) of methane (natural gas) using a hydrogen-permselective membrane reactor.

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