Ceramic Membranes in Carbon Capture Processes

J. C. Diniz da Costa

FIMLab – Films and Inorganic Membrane Laboratory and Centre for Coal Energy Technology, School of Chemical Engineering, The University of Queensland, Brisbane Qld 4072, Australia.

Abstract

Coal underpins the bulk majority of Australia's energy production and likewise its contribution is significant in many countries around the world. As a result, anthropogenic emissions are associated with climate change and there is a world concerted effort supported by Governments and Industry to develop novel enabling technologies to meet carbon emission reduction. Examples include the Kyoto Protocol or the establishment of the Global Carbon Capture and Storage Institute in 2008. This work assesses carbon capture technologies for gas processing under R&D in the Australian program for low emission technologies. Of particular attention, this presentation will focus on oxyfuel coal power and integrated gasification combined cycle (IGCC) systems which require high temperature gas processing. These include an air separation unit to supply O_2 to a boiler or coal gasifier, syngas processing to separate H_2 from CO_2, or to shift CO as a membrane reactor in the water gas shift reaction.

In view of its inherent properties, advanced ceramic membranes have the capabilities to operate at high temperatures and improve process efficiencies, thus very attractive for carbon capture systems. This presentation focus on the work being carried out at the FIMLab and covering the following topics:

1) Metal silica membranes for H_2 separation at high temperatures (up to 500^{o}C).
2) CO shifting in membrane reactors for both low temperature and high temperature water gas shift reaction.
3) Computational Fluid Dynamics of gas separation membrane modules.
4) O_2 separation using perovskite membranes.
5) Scale up and multiple tubular membrane systems.