Morphological Characterization and Gas Permeation of Commercially Available Alumina Membrane

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Abstract : This work presents experimental results relating to the structural characterization of a commercially available alumina membrane. A γ -alumina mesoporous tubular membrane has been used. Nitrogen adsorption-desorption, scanning electron microscopy and gas permeability test has been carried out on the alumina membrane to characterize its structural features. Scanning electron microscopy (SEM) was used to determine the pore size distribution of the membrane. Pore size, specific surface area and pore size distribution were also determined with the use of the Nitrogen adsorption-desorption instrument. Gas permeation tests were carried out on the membrane using a variety of single and mixed gases. The permeabilities at different pressure between 0.05-1 bar and temperature range of 25-2000C were used for the single and mixed gases: nitrogen (N2), helium (He), oxygen (O2), carbon dioxide (CO2), 14%CO₂/N₂, 60%CO₂/N₂, 30%CO₂/CH4 and 21%O₂/N₂. Plots of flow rate verses pressure were obtained. Results got showed the effect of temperature on the permeation rate of the various gases. At 0.5 bar for example, the flow rate for N2 was relatively constant before decreasing with an increase in temperature, while for O2, it continuously decreased with an increase in temperature. In the case of 30%CO₂/CH4 and 14%CO₂/N₂, the flow rate showed an increase then a decrease with increase in temperature. The effect of temperature on the membrane performance of the various gases is presented and the influence of the trans membrane pressure drop will be discussed in this paper.

Keywords : alumina membrane, Nitrogen adsorption-desorption, scanning electron microscopy, gas permeation, temperature **Conference Title :** ICIM 2015 : International Conference on Inorganic Membranes

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