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Effect of temperature on gas transfer through alumina membrane

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Membrane utilization in various field processing applications is a dynamic and rapidly growing field. In this study, a composite membrane consisting of a porous γ -alumina support layer was used. The membrane and support measured 7 mm internal diameter and 10 mm outer diameter, respectively. This work discusses results obtained from the permeability test of some single gases carried out at high temperature. The flow rates at gauge pressure between 0.1-1 Bar and temperature 298 K were obtained and graphs of flow rate were plotted against pressure. The single gases used were oxygen (O_2), helium (He), nitrogen (N_2) and carbon dioxide (CO_2). Results obtained from the plots showed an order in the rate of flow of the gases through the membrane. At 298 K and 323 K, for example, the flow rate increased in the order $He > O_2 > N_2 > CO_2$. As the temperature was increased to 373 K, 423 K and 473 K, the order of increase in flow rate was then $He > O_2 > N_2 > CO_2$. The influence of a number of factors, for instance, kinetic diameter and molecular weight of the gases, will be discussed with respect to their permeation rate. The overall results illustrated an initial viscous flow mechanism, then, Knudsen transport mechanism as pressure was increased.

Biography

Ifeyinwa Orakwe is currently undertaking her PhD programme at the Robert Gordon University, Aberdeen, United Kingdom. Her research involves designing an integrated membrane catalytic reactor process for the removal of dissolved oxygen from water for downhole injection applications. Has a Bachelor's degree in Chemistry and Master's degree in Environmental Science. By occupation, she is a Laboratory/Environmental Analyst. In her research career, she has published in professional journal papers and made oral presentations at international conferences. Her research interests are in the areas of oil & gas, waste water and designing inorganic hybrid ceramic membrane for the purpose of water treatment.

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