# Carbon dioxide/methane separation performance by mixed matrix membrane from polysulfone/ halloysite nanotubes

## ABSTRACT

Gas separation by using membrane-based technology is one of the rising technologies used in the industry. It has many advantages such as low in cost and energy consumption. However, this technology is limited because of the "trade-off" exists between permeability and selectivity of the membrane. Thus, in this study, an inorganic filler, halloysite nanotube is modified with 3-aminopropyl (triethoxysilane) and then incorporated into the polysulfone polymer and the performance of the mixed matrix membranes (MMMs) is investigated. MMMs were analyzed by using SEM, FTIR, tensile and gas permeation tests which studied the morphological differences, mechanical strength, and membrane permeability and selectivity towards CO2and CH4respectively. The performance of the MMMs was compared with neat membrane and MMMs with unmodified HNTs. SEM results show an increase of 111% on the thickness of the dense skin layer of MMMs with APTES-modified HNTs compared to the neat membrane and the MMMs with unmodified HNTs. Elongation at break for MMMs with 3-APTES-modified HNTs also increased to 24.22%. The gas separation performance of the MMMs with 3-APTES modified HNTs shows an overall increase of 25.37% in the membrane selectivity compared to MMMs with unmodified HNTs while when coating is done, the selectivity of the MMMs with 3-APTES modified HNTs shows an increase from 0.845 to 10.158 for a pressure of 2 bar showing that coating helps in increasing the selectivity of the membrane.