NANOPOROUS SILICA AEROGEL MEMBRANES FOR CO2 CAPTURE

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Abstract - The use of a membrane contactor combined with a hydrophobic porous membrane and amine absorbent has attracted considerable attention for the capture of CO2 due to its extensive use, low operational costs and low energy consumption. The hydrophobic porous membrane interface prevents the passage of the amine absorbent while allowing the penetration of CO2 molecules absorbed by the amine absorbent. Herein, for the first time, highly mesoporous and water-repellent SiO2 aerogels were successfully coated onto a macroporous Al2O3 membrane using different silanol precursors, such as tetraethyl orthosilicate (TEOS), methyltrimethoxysilane (MTMS) and bis(triethoxysilyl) ethane (BETES). The silica-based hydrophobic SiO2 aerogel membranes exhibited much higher CO2 absorption flux than the uncoated silica-based aerogel membranes and could be reused and continuously operated for CO2 absorption for extended periods of time. As a result, silica-based water-repellent aerogel membrane contactors are a promising technology for large-scale CO2 absorption post-combustion in power plants.