

Polymers in Separation Applications

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Polymers are materials which have good fabrication characteristics. Because of that, they found many applications in engineering practices such as packaging, automotive, electronics, medical devices, separation applications etc. Since the first discovery of permeation of gases through a polymeric film at different rates by Mithchell in 1831, different polymeric materials have been used in many separation applications such as water treatment, gas purification, metal enrichment etc.

Despite the first separation operations, membrane technology has been used successfully for water treatment since 1960. There are now five generally recognized membrane water treatment processes in widespread use: microfiltration, dialysis, electrodialysis, reverse osmosis and ultrafiltration. Separation of gases by polymeric membranes has found its first industrial applications in the early 1950's in enrichment of oxygen from air, recovery of helium from natural gas, separation of hydrogen from coal-hydrogenation tail gas and refinery gas.

Polymers can be fabricated easily to give a thin film shape, but those films neither sufficiently permeable nor selective for use in gas separation. There are several approaches to solve this problem: manufacturing composite polymeric films, replacing the polymer with a liquid and introducing a nano-sized porous material into the polymer.