

Absorption/membrane integrated hybrid systems for multicomponent gas separation

D.G.Bessarabov, R.D.Sanderson, E.P.Jacobs

*University of Stellenbosch, Institute for Polymer Science,
Stellenbosch, 7599, South Africa*

I.N. Beckman,

Moscow State University, Russia

V.V. Teplyakov

*A.V.Topchiev Institute of Petrochemical Synthesis,
Russian Academy of Science*

The prospects for hybrid gas-separation membrane systems comprising a membrane permabsorber and a selective membrane valve, with flowing-liquid extragents are discussed.

The membrane permabsorber is an integrated membrane system involving a liquid flowing along a non-porous polymeric gas-separation membrane. The membrane permabsorber has one inlet for the feed and two outlets for the products (retentate and desorbate) The first component of the feed (retentate) is insoluble in a liquid; the other one is soluble in a liquid, and diffuses through the non-porous polymeric membrane where it is absorbed and pumped to be degassed in a stripper.

In the selective membrane valve a liquid absorbent flows between two non-porous membranes, a three-component gas mixture can be separated by the membrane valve: the first component is insoluble in a liquid carrier, the second one diffuses through the membrane sandwich, and the third component dissolves in a liquid layer and is pumped to a desorption module for degassing; thus, the selective membrane valve has one inlet for the feed and three outlets for the products.

The flow rate of a liquid, its temperature, concentration of a carrier in the liquid and thickness of the liquid layer are the main factors controlling gas separation.

The use of the flowing liquid along non-porous membranes between turbulence-promoter spacers allows a decrease in diffusional resistance greater than can be obtained with a conventional liquid membrane.

The liquid absorbent can be selectively specific for one of the gaseous components and a highly selective gas separation process the output of which is determined by the efficiency of the polymeric membranes can be carried out.