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Laboratory of Membrane and Catalytic Processes, Nanotechnology and Biotechnology Department, Nizhny Novgorod State Technical University n.a. R.E. Alekseev, 24 Minina Str., Nizhny Novgorod, 603950, Russia

[*]*Corresponding author: Ilya V. Vorotyntsev. 24 Minina Str., Nizhny Novgorod, 603950, Russia. Tel/Fax: +7 831 4360361; E-mail: ilyavorotyntsev@gmail.com;*

Abstract

The effect of a pulsed retentate flow operation on the gas separation performance of a single membrane module during removal of a fast-permeant impurity from a slow-permeant target component has been studied both theoretically and experimentally. It has been shown that a novel two-step cyclic process promotes a higher driving force for more intense mass transfer due to periodical disturbance of a near-stationary state establishing in the module. Notably, the transmembrane pressure differences is not intentionally affected during the process and remains constant under continuous feed admission and permeate evacuation with negligible fluctuations generated by periodical retentate withdrawals. Opposed to transient permeation processes the separation is based on the permselectivity regardless of whether it is determined by the diffusion selectivity or solubility selectivity. The separation efficiency of a pulsed retentate operation has been compared to that of a steady-state operation depending on the productivity of the process both through the simulation study and the experiments using radial counter-current membrane module for separation of various model mixtures. It has been shown that novel approach may