národní
úložiště
šedé
literatury

Development of Vapour Permeation Apparatus.

Morávková, Lenka
2018

Dostupný z http://www.nusl.cz/ntk/nusl-387478

Dílo je chráněno podle autorského zákona č. 121/2000 Sb.

Tento dokument byl stažen z Národního úložiště šedé literatury (NUŠL).

Datum stažení: 29.05.2024

Další dokumenty můžete najít prostřednictvím vyhledávacího rozhraní nusl.cz .

Development of vapour permeation apparatus

L. Morávková, J. Vejražka, Z. Petrusová
Czech Acad. Sci., Inst. Chem. Proc. Fundam., Rozvojova 135, 165 02 Prague 6, Czech Republic; tel. +420 220 390 133, e-mail: petrusova@icpf.cas.cz

Nowadays, it is necessary to separate volatile organic compounds (VOCs) emitted into the air from chemical and petrochemical plants. Membrane separation is an elegant solution for VOC capture thanks to a number of advantages such as energy savings, low operating costs, very good selectivity and efficient separation.

The transport and separation properties of membrane can be radically changed by a long exposure of organic vapours. However, a study of steady state permeation is time-consuming and many papers usually report only a quick test of virgin membranes. Therefore, a big lack of such information has to be filled. This contribution includes the main information about development of test-stand apparatus for vapour permeation at the Institute of Chemical Process Fundamentals at the Czech Academy of Sciences.

The development included an analyses of potential experimental errors such as an uncertainty of temperature in the saturator or the pressure in retentate or permeate stream, etc. Further step was an analyses of chemical-engineering approach for mass balance. All variables were discussed and experimental errors were minimalized. The calibration was done for representative VOCs such as hexane, cyclohexane, isooctane, ethanol and toluene.

The vapour permeation were determined either by on-line FID analyses or from permeate pressure increase. The amount of VOCs was checked by a collecting in cold trap. Furthermore, membrane were examined by SEM analyses and their properties were checked after the long exposure of VOCs. For example, low-density polyethylene showed very low flux but very stable and reproducible results. While a reverse-osmotic thin-film composite membrane is sensitive and the defects are created more often when the thin selective layer is thinner (SEM analyses). The selected interesting results will be presented for an intrinsic microporous membrane.

The financial support from the Czech Science Foundation by the project No. 17-03367Y is gratefully acknowledged.