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New experimental setup for continuous mass flux measurement in pervaporation

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Highlights:

- New experimental setup was designed for continuous permeate mass flux measurement in pervaporation
- Mass flux measured with pressure sensor is validated by comparing to results obtained from conventional gravimetric method
- Relative high frequency of mass flux measurement allows to consider coupling with heat flux measurement in unsteady state

Abstract

Pervaporation is a separation process of liquid mixtures through a thin non-porous membrane. In vacuum pervaporation, the global mass flux is classically estimated by weighing the mass of permeate collected in cold traps. In this work, we propose a new experimental setup that allows a continuous measurement of the mass flux. The new mass flux method measurement was validated for single component permeation (ethanol and water) by comparing mass of permeate collected in cold traps with the level decrease of feed liquid measured with a pressure sensor. This new setup can be useful for laboratory studies dealing with the evolution of mass flux according to different parameters of the process as, for example, the permeate side pressure level or temperature of liquid feed.

Keywords: Pervaporation, Unsteady state measurement, Mass flux

1 Introduction

Pervaporation is used for the separation of liquid mixtures through a non-porous and selective membrane. In vacuum pervaporation or sweeping gas pervaporation, the driving force for mass transport is the difference of chemical potential between the liquid feed and the permeate [1]. In the first case the permeate side is kept at reduced pressure using a vacuum

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