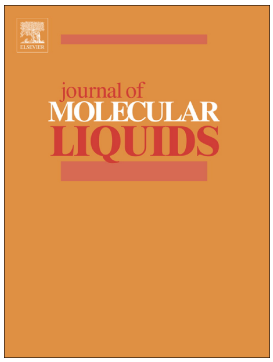

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Experimental and simulation investigation on separation of binary hydrocarbon mixture by thermogravitational column

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Abstract

In this article, experimental and numerical investigations are performed to study a thermogravitational Column (TGC) for the separation of toluene/n-heptane mixture. This research has tried to determine the main significant parameters and their effects on the performance of the process. In experimental examinations, the influence of the main parameters such as feed flow rate, cut and temperature gradient on the performance of the TGC efficiency is studied. In addition, computational fluid dynamics is used to simulate the separation process in this review. The response surface methodology (RSM) was also applied to minimize the number of runs and investigate the optimum operating conditions. The numerical results showed that the predicted data were in good agreement with experimental data, and the average error between experimental and simulation data was around 20%. It was found that the separation factor increased by 129 % when the feed rate is changed from 4 to 0.8 ml/min at Θ=0.5 and ΔT=40 K. As the temperature gradient increased from 40 K to 60 K, the mass fraction of n-heptane also increases from 6.5% and 11.6%. The optimum conditions were achieved at the feed flow rate 0.81 ml/min, cut 0.21 and temperature gradient 58.04 K with separation factor 1.17.

Keywords: Thermogravitational Column; n-heptane/toluene separation; Computational fluid dynamics; Response surface methodology.

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