Performance analysis of batch fractional distillation of essential oils, a simulation study for cinnamon leaf oil

M.N.I. Ahamed, W.U.L.R. Dissanayake, N.D.I. Kumarage, A.D.U.S. Amarasinghe[#], M. Narayana[#]
Department of Chemical and Process Engineering, University of Moratuwa, Sri Lanka.
[#]adusa2@uom.lk and mahinsasa@uom.lk

Batch distillation is a popular method used in the fractionation of essential oils. The feasibility of separation to achieve a target purity in the product from a given feed composition depends mainly on the Reflux ratio (R) and the Number of plates (N). Batch distillation process is simulated in this study for enriching Eugenol in Cinnamon leaf oil as a case study. Four Performance Parameters, namely the Average Production Rate (APR), Product Yield (Y), Average Heating Requirement (AHR), and Average Cooling requirement (ACR) are considered for the analysis. The contour plots generated from the simulation study are useful for Eugenol manufacturers to identify the range of R and N for feasible separation and to select the suitable combination of R and N to maximize APR or Y and minimize the AHR and ACR. According to the simulation results for a feed containing 88.8 weight percent Eugenol, the enrichment of 95 weight percent could be achieved by operating at N values from 1 to 25 and R values from 0.25 to 5.00. However, the range of N and R for feasible separation is found to depend on the feed composition and the target purity of Eugenol in the product.

Keywords: Batch distillation, fractionation, essential oils, performance analysis, modelling and simulation