

Recovery of Minor Palm Oil Compounds Using Packed Bed Adsorption Column

ABSTRACT

Carotene and tocopherol are valuable products that exist as minor compounds in palm oil and mostly extracted out during many stages of palm oil processing. Hence, most of it ended up in wastewater or palm oil mill effluent (POME). Fortunately, adsorption is potentially one of the most efficient method as compared to the others. In fact, it is widely studied in laboratory scale, in order to obtain equilibrium data for the steady state system. However, industrial practices are mostly operated in unsteady state in a continuous manner. Consequently, this study is executed to design a recovery process of one of the minor compounds in palm oil mill effluent (POME), which is carotene, using silica gel. It aims to predict the dynamic adsorption of recovery of minor compounds from palm oil mill effluent based on available equilibrium data, investigate the effects of dynamic and physical properties of the system towards the process by analyzing the breakthrough curve and study the feasibility of the scale up process by performing a sensitivity analysis on the system. Then, a base simulation was prepared by using available equilibrium data. Operating and design parameters such as, bed height, inlet flowrate and concentration were manipulated. Consistent with previous packed column studies, increase flow and concentration will reduce the time required for the column to achieve saturation, while increase bed height effects were vice versa. Finally, the last objective to achieve was to study the practicality of the packed bed column and perform a sensitivity on assumptions and predictions such as predicted mass transfer coefficient and isotherm model. It is proven that the selection of isotherm model and prediction in coefficient did not pose a large impact to the breakthrough curve and the average time required for the column of 1.5 m tall and 0.8 in diameter, to reach breakthrough time is 1.7 days. Hence, it can be concluded that adsorption technology using silica gel as its adsorbent can be applied is recovering minor compounds in palm oil mills.