

Mathematical modeling of volatile organic compounds removal over activated carbon

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Abstract

Removal of volatile organic compounds (VOC) from air is essential due to health issues. An industrial cyclic temperature swing adsorption (TSA) unit is investigated over activated carbon. The comparison of industrial data with that of model showed good agreement between them. The results showed that ethanol is more adsorbed on activated carbon than diethyl ether and outlet concentration of diethyl ether exceeds its inlet concentration due to its partial replacement by ethanol. Performance of the TSA unit is measured through calculating diethyl ether and ethanol recoveries. Moreover, an energy requirement is also added into the model and multi-objective optimization has been carried out. High model accuracy of 99.98 % is obtained for objectives indicating a good fitting. The suggested optimum variables were duration of heating steps 30min, duration of cooling steps 20 min, regeneration flow rate of 400 kmol/h and humidity of 0.001 in air.

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