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ADSORPTION OF PHENOLIC COMPOUNDS ONTO GRANULAR ACTIVATED CARBON: ISOTHERMS AND BREAKTHROUGH CURVES

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ABSTRACT

Continuous fixed bed study and batch adsorption study were carried out by using NORIT Granular Activated Carbon 1240 (GAC) as an adsorbent for the removal of phenol, O-Cresol and 4-chlorophenol from aqueous solution. In the continuous fixed bed study, the effect of flow rate, bed volume and inlet initial concentration on the adsorption characteristics of adsorbent was investigated at 30°C in an up-flow fixed bed column. Data obtained from the experiments confirmed that the equilibrium phenols uptake per g of granular activated carbon in the column decreased with increasing flow rate, increased with increasing inlet concentration and bed volume. Series of batch adsorption tests also have been carried out for phenol, O-Cresol and 4-Chlorophenol removal from aqueous solution using NORIT Granular Activated Carbon 1240 (GAC) at 30 °C. The data were fitted to the Langmuir and Freundlich equations in order to determine the kinetic parameters that characterizing the adsorption system. The results shown that the equilibrium data fitted both models within the concentration range studied. Four kinetic models ; Constant Pattern Wave, Adam-Bohart, Thomas and Yoon-Nelson models were applied to experimental data to predict the breakthrough curves and to determine the characteristic parameters of the column useful for process design. The overall liquid-phase mass transfer coefficients and the breakthrough time, t ½ were also determined by the Constant-Pattern wave approach. The Thomas and the Yoon-Nelson models were found suitable for describing the whole

part of the dynamic behavior of the column with respect to flow rate, bed volume and inlet phenols concentration. Meanwhile the Constant Pattern-Wave and the Adam-Bohart models only could be applied for a definite part of the dynamic behavior of the column with respect to flow rate and initial concentration.