

Determination of Chemical and Adsorption Kinetics: An Investigation of a Petrochemical Wastewater Treatment Utilizing GAC

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Abstract : Petrochemical industries are playing an important role in producing wastewaters. Nowadays different methods are employed to treat these materials. The goal of the present research was to reduce the COD of a petrochemical wastewater via adsorption technique using a commercial granular activated carbon (GAC) as adsorbent. In the current study, parameters of kinetic models as well as; adsorption isotherms were determined through utilizing the Langmuir and Freundlich isotherms. The key parameters of $K_L = 0.0009$ and $q_m = 33.33$ for the former and $n_f = 0.5$ and $K_f = 0.000004$ for the latter isotherms resulted. Moreover, a correlation coefficient of above 90% for both cases proved logical use of such isotherms. On the other hand, pseudo-first and -second order kinetics equations were implemented. These resulted in coefficients of $k_1 = 0.005$ and $q_e = 2018$ as well as; $K_2 = 0.009$ and $q_e = 1250$; respectively. In addition, obtaining the correlation coefficients of 0.94 and 0.68 for these 1st and 2nd order kinetics; respectively indicated advantageous use of the former model. Furthermore, a significant experimental reduction of the petrochemical wastewater COD revealed that, using GAC for the process undertaken was an efficient mean of treatment. Ultimately, the current investigation paved down the road for predicting the system's behavior on industrial scale.

Keywords : petrochemical wastewater, adsorption, granular activated carbon, equilibrium isotherm, kinetic model

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