

Continuous Fixed Bed Reactor Application for Decolourization of Textile Effluent by Adsorption on NaOH Treated Eggshell

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Abstract : Fixed bed adsorption has become a frequently used industrial application in wastewater treatment processes. Various low cost adsorbents have been studied for their applicability in treatment of different types of effluents. In this work, the intention of the study was to explore the efficacy and feasibility for azo dye, Acid Orange 7 (AO7) adsorption onto fixed bed column of NaOH Treated eggshell (TES). The effect of various parameters like flow rate, initial dye concentration, and bed height were exploited in this study. The studies confirmed that the breakthrough curves were dependent on flow rate, initial dye concentration solution of AO7 and bed depth. The Thomas, Yoon–Nelson, and Adams and Bohart models were analysed to evaluate the column adsorption performance. The adsorption capacity, rate constant and correlation coefficient associated to each model for column adsorption was calculated and mentioned. The column experimental data were fitted well with Thomas model with coefficients of correlation $R^2 \geq 0.93$ at different conditions but the Yoon–Nelson, BDST and Bohart–Adams model ($R^2=0.911$), predicted poor performance of fixed-bed column. The (TES) was shown to be suitable adsorbent for adsorption of AO7 using fixed-bed adsorption column.

Keywords : adsorption models, acid orange 7, bed depth, breakthrough, dye adsorption, fixed-bed column, treated eggshell

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