International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.12, pp 111-137, 2017

Kinetic and Isotherm studies on the removal of acid dye (NG) from aqueous solutions by adsorption onto activated carbon low cost agricultural waste

Pandi Muthuraman[1*], Rajendheran Sakthivel[2], Arulanantham Xavier[3]

[1]Department of Chemistry Yadava College, Madurai-625 014, Tamil Nadu, India.
[2,3]PG and Department of Chemistry, The Madura College, Madurai-625 011, Tamil Nadu, India.

Abstract : In this research five low cost carbon adsorbents, namely, Sorghum Vulgare Carbon (SVC), Zea Mays Carbon (ZMC), Sorghum Vulgare Varity Carbon (SVVC), Ceiba Peutandra Carbon (CPC), Projobis Juliflora Carbon (PJC) were prepared for the adsorption of Nigrosinedye(NG). Adsorption was studied as a function of pH (2-12), adsorbent dose (0.2-1.6g), contact time (5-40mints), initial MG concentration (50-100mg/L); agitation seed (120-180rpm) and characterization of FT-IR, XRD, EDAX, and SEM. From the results obtained it was observed that with the increase in the pH value, the percentage NG removal increases from 48.62,52.33,38.74,46.68, and 55.03% to 94.48,95.15 , 95.45,94.5,and 94.84% for SVC,ZMC,SVVC,CPC, and PJC adsorbents, respectively. Additionally the percentage NG removal increased from 45.86, 43.12, 56.71, 47.78, and 39.81% for SVC, ZMC, SVVC, CPC, and PJC adsorbents ,respectively, by increasing, adsorbent dose from 0.2g to 1.6g.Hence optimize adsorbent dose for SVC, ZMC, SVVC, CPC, and PJC adsorbents 0.8,1.0,1.2,1.4, and 1.6g, respectively. The experimental data were analyzed by the Langmuir, Freundlich, Temkin, Redlich-Peterson,Dubinin- Radushkevich and BET-isotherm constants. Results showed that the maximum monolayer adsorption capacity of SVC, ZMC, SVVC, CPC, and PJC adsorbents for the adsorption of NG was 20.99, 21.64, 21.51, 21.58 and 20.9mg/g respectively. The kinetic data were fitted to the pseudo-first-order, pseudo-second-order, intraparticle diffusion models, Elovich, Natrajan and Khalaf, Bhattacharaya and Venkobachar models. Adsorbents tracked Langmuir adsorption isotherm models and pseudo-second-order kinetics. Kinetics parameters were evaluated to predict the nature of adsorption. In this paper indicate the endothermic and spontaneous nature of the adsorption process.

Keywords : Agricultural waste, lowcost carbon, Nigrosine dye, optimization, Batch adsorption, Kinetics.

*****