Removal of nitrate from water by adsorption onto zinc chloride treated activated carbon

Adsorption study with untreated and zinc chloride (ZnCl2) treated coconut granular activated carbon (GAC) for nitrate removal from water has been carried out. Untreated coconut GAC was treated with ZnCl2 and carbonized. The optimal conditions were selected by studying the influence of process variables such as chemical ratio and activation temperature. Experimental results reveal that chemical weight ratio of 200% and temperature of 500 degrees C was found to be optimum for the maximum removal of nitrate from water. Both untreated and ZnCl2 treated coconut GACs were characterized by scanning electron microscopy (SEM), Brunauer Emmett Teller (BET) N-2-gas adsorption, surface area and Energy Dispersive X-Ray (EDX) analysis. The comparison between untreated and ZnCl2 treated GAC indicates that treatment with ZnCl2 has significantly improved the adsorption efficacy of untreated GAC. The adsorption capacity of untreated and ZnCl2 treated coconut GACs were found 1.7 and 10.2 mg/g, respectively. The adsorption of nitrate on ZnCl2 treated coconut GAC was studied as a function of contact time, initial concentration of nitrate anion, temperature, and pH by batch mode adsorption experiments. The kinetic study reveals that equilibrium was achieved within one hour. The adsorption data conform best fit to the Langmuir isotherm. Kinetic study results reveal that present adsorption system followed a pseudo-second-order kinetics with pore-diffusion-controlled. Results of the present study recommend that the adsorption process using ZnCl2 treated coconut GAC might be a promising innovative technology in future for nitrates removal from drinking water.

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