Examination of Adsorption Isotherm Models of Ni(II) ions by Activated Carbon & Pistachio Shells within Equilibrium Time

Abstract

Determination of equilibrium time is one of the main parameters of absorption isotherms equations are used. On the other hand, for the absorption isotherm experiments is used the change of mass in constant concentration and constant temperature or change of concentration in constant mass and constant temperature. Both methods are assume stable " absorption equilibrium time " in different masses (or different concentrations of absorbent). Therefore, the main purpose of this study is examination of effect of changing mass of pistachio shell and activated carbon adsorbents over time the equilibrium of absorption and examination of absorption isotherm models of Nickel ion in within equilibrium time also.

In this study was used from pistachio shells and activated carbon for to remove of nickel ions from the aqueous solution. To do this, pistachio shell prepare from Rafsanjan Pistachio gardens and Its particle size selected between 600-800 microns. For experiments used from nickel ions Stokes solution (1000 mg/l) by the incorporation of nickel nitrate salt ($NiSO_4.6H_2O$) Merck, Germany manufacturing plant with distilled water been produced. The results showed that the maximum absorption efficiency at pH=8 to equal to 73/3%. Also, it was shown that with increasing adsorbent dose from 1 to 5 g/l, equilibrium time decreased from 120 to 15 minutes. Fitting kinetic models Lagergren, Ho et al (1996), Avrami, Intraparticle diffusion on the absorbance data showed that although Lagergren model gives a better estimate of the qe value but Ho *et al*(1996) model based assessment described absorption data better than other models. The comparison rate of nickel absorption showed that Rafsanjan Pistachio shell can be a good absorber of race to other.

activated carbon powder from Merck was purchased in Germany. The results showed that the maximum absorption efficiency for a 1gr absorber at pH=8 and is equal to 35/40%. Also shown that the maximum equilibrium time for the initial concentration of 100 mg/l solution, within mass 25 g/l is equal to 400 minutes and minimum of equilibrium time to occure in mass less than 5 g/l and more than 70 g/ L .

Kinetic absorption models fitted on experimental data showed that for activated carbon adsorbent in masses 1, 3, 5, 10, 50, 60, 70, 80, 90 and 100 g/ L, the Avrami and Lagergren models have been fitted The best models and these two models are consistent over time. The Elovich model in the mass of 15 g/L and Ho et al(1996) model in masses 20, 25, 30, 35 and 40 g/L fitted the best over experimental data. So we can say that within low and high masses, Avrami and Lagergren models better to fit the experimental data, also in the average masses, the experimental data better to describe by Ho et al(1996) model. Absorption isotherm model fitted on experimental data showed that for activated carbon adsorbent the Redlich-Peterson model are given the best fit other than isotherm model, and for the pistachio shells the Freundlich, Sips and Radke-Praunitz models are the best fit than other models of isotherms and are consistent over time. All over models within

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