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OPTIMIZATION OF NITRITE ADSORPTION IN WATER USING THE EXPANDED ORGANOPHILIZATED VERMICULITE

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1. INTRODUCTION

The existence of nutrients from nitrogenous compounds contributes to the reduction of the water quality, because of the incidence of management associated to the agricultural crop on a large scale and also the existence of urban area in need of basic sanitation. Those nutrients are pointed as one of the main intensifying sources of the eutrophication process[1]. The removal of those nutrients in the water is through conventional treatments techniques, as in the physicochemical and biological processes, in which the processes are time-consuming and with high costs. Solid materials of adsorbent action are being used with the intention of replacing those tecniques, among these materials there is the expanded organophilizated vermiculite. Studies show that the vermiculite in the hydrophobic mineral shape can be used in the treatment of polluted waters by the industrial residues, oils, among others, and it can also help to repair enviromental disasters, such as the recents oil spills[2]. In this way the use of adsorbent materials is extremely relevant, in order to minimize such impacts. This paper aims to determine the great relationship between the variables, the percentage, granulometry and vermiculite mass of the organically modified product in tests of nitrite adsorption in water by organophilizated vermiculite using a 2^3 complete experimental planning.

2. MATERIALS AND METHODS

The clay mineral vermiculite used in this paper was acquired in the city of Santa Luzia, Paraíba, Brazil. The vermiculite was mashed in a mill, sifted in 120, 200 and 270 mesh sieves and expanded to the temperature of 800 ºC. Then, the expanded vermiculite was subjected to the organophilization. For that, the vermiculite was taken to the muffle at a temperature of 200 ºC to the hot insertion of the cerotic acid. The adsorption tests in nitrile batch were executed in duplicates, keeping fixed the nitrite initial concentration (100 mg L^{-1}), the stirring (200 rpm) and the adsorbent's time of esposure (15 minutes). The maximum and minimum levels of the variables that optimized in the experimental planning were: the percentage of the organically modified product, level (-) 20% and level (+) 10%; granulometry, level (+) 100 mesh and level (-) 200 mesh; and vermiculite mass, level (-) 0.1 g and level (+) 0.5 g. Such variables and their maximum and minimum levels were defined by the literature and a previous test was executed in the laboratory.

2. RESULTS AND DISCUSSION

By the analysis of the variance (ANOVA) of the linear model, the power of prediction was tested through Fischer's test (F), for regression. The adjustment lack of the model was executed through the F test and by the correlation coefficient (R^2), whose value was 0.94 [3]. The adjustment and prediction tests of the model were executed to the significance level of 5%. The normality of the residues distribution of the model, comparing to the experimental points was tested by the graphic of normal probability of the residues, in which was observed the proximity of the experimental values around the line of normal values of residues [4].

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3. CONCLUSIONS

The statistic model choosen seemed to be predictive and reasonably adjusted to the optimization of the adsorption in nitrile batch. Moreover, the residues distributed themselves in an approximately normal manner. From these confirmations, it can be stated that the model was in fact satisfactory. The results indicate that the great conditions for the nitrite adsorption (93.75%) applying the vermiculite occurred when 10% of the organically modified product, 200 mesh of granulometry e 0.1 g of vermiculite's mass were used.

Gratitude
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