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Discoloration of Vegetable Oil on an Activated Material

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ABSTRACT

With the aim of preparing a material with very significant decolorizing power against olive oil and in order to improve the surface properties of local bentonite clays, acid activation was carried out (sulfuric or hydrochloric acids at different concentrations) which is a chemical treatment generally used to optimize the adsorption capacity of this type of material, with a view to its use as a discoloration adsorbent of a vegetable oil such as olive oil.

Keywords: Activation**,** Characterization, Microporosity, Discoloration, Vegetable Oil.

1 Introduction

In any chemical or physical process for refining vegetable oils, discoloration is a critical and determining step [1]. Its main purpose is the elimination of pigments such as carotenes, chlorophylls and other compounds such as phospholipids, fatty acids, oxidation products (peroxide), trace metals (iron, copper) and phosphorus compounds present in crude oil [2] . Adsorption therefore remains the appropriate process for eliminating these impurities in which bentonite or zeolitic clays activated at different acid concentrations play the role of adsorbents [3]. Not all smectic clays have decolorizing power that can be improved by acid treatment. Only a few types, in particular bentonites (clays containing at least 50% smectitic fraction) can be activated to produce high efficiency adsorbents [4, 5]. This treatment increases the load on the clay particles, and makes them more effective in the discoloration vegetable, mineral and animal oils [1-4].

2 Experimental

we carried out the physicochemical characterization and the determination of the optimal Activation conditions (Acid concentration: 7M at temperature T=80°C, Activation time= 4h, Quantity of H_2SO_4 adsorbed=1.95meq /g of clay, Cation exchange capacity CEC=95meq/100g of clay, Specific surface area=1700 m²/g) in order to obtain an activated bentonite suitable and ready for the operation of decolorization of olive oil according to a continuous dynamic system (in column) for the elimination of the dye methylene blue and the copper metal. The activated bentonites were characterized by the following techniques: X-ray fluorescence (atomic percentage), X-ray diffraction, Scanning electron microscope.

3 Results and Discussion

Activated bentonites do not undergo any chemical modifications or the destruction of their crystalline networks and the creation of a more uniform and homogeneous microporous structure and which is better confirmed by X-ray diffraction, X-ray fluorescence and SEM. We have carried out olive oil discoloration tests to remove methylene blue and copper metal, very high decolorization efficiencies have been recorded for the following optimal conditions: at temperature T=25°C, the quantity of clay adsorbent =15g, pH=6, column heigh =20 cm for methylene blue, and at temperature T=15°C, the quantity of clay adsorbent =10g, pH=5.5, column height =20 cm for copper. Activated bentonites are very effective adsorbents in the depollution of vegetable oils.

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4 Conclusions

The physical and textural properties of the activated materials studied confirm the improvement of the microporous crystalline structure and the creation of a more developed molecular sieve network. With determined structural and textural properties, activated bentonites are very reactive and high-performance materials and can also be used in effluent depollution processes or decolorization of vegetable oils.

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