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STUDY ON DEALUMINATED ZEOLITIC TUFF FOR HYDROCARBON REMOVAL FROM WATER

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Abstract

This study aims to develop a new adsorbent from Jordanian raw zeolitic tuff (RZT) for oil depollution control of surface waters. Therefore the properties of chemically treated Jordanian dealuminated zeolitic tuff were investigated. Zeolitic tuff (i.e., phillipsite-rich tuffs) was modified via (i) dealumination by single acidic treatment (TZT) and (ii) further treatment of the dealuminated zeolitic tuff by microemulsion technique (MeTZT). Series of adsorbents were prepared by impregnation method and characterized by using different techniques such as: X-ray Diffraction (XRD), Fourier Transform Infrared Spectrometry (FT-IR), Brunauer–Emmett–Teller (BET) method, Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray (EDX) to obtain information about the structural, chemical and surface properties of zeolite materials. The performance of the adsorbents was followed by adsorption capacity measurements expressed as the ratio of the mass of adsorbed hydrocarbon to the weight of the used sorbent. The adsorption capacities of the dealuminated zeolitic tuff were studied under different experimental conditions for model hydrocarbon pollutants, using a Total Organic Carbon (TOC) analyzer. The obtained results revealed that the adsorption capacity of the modified zeolitic tuff improved by increasing the hydrophobic properties. A comparative account of the adsorption capacities of all adsorbents was compared to activated carbon type AquaCarb. The sorption capacity increased from 34% (for RZT) to 107% for (TZT) using kerosene as model hydrocarbon mixture, and from 85% to 162% for octane model compound, while the sorption capacity enhanced from 116% to166 % for dodecane model compound, when the sorption capacities were tested by using RZT and TZT. However, when the microemulsified treated zeolitic tuff was tested even higher hydrocarbon sorption capacities were measured than in case of the deauliminated zeolitic tuff, which supports the notion that the surface modification of the zeolitic tuff was successful.

Key words: adsorption, adsorption capacity, dealumination, oil spills, zeolitic tuff

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