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CHARACTERISTICS OF K^+ AND NH_4^+ ADSORPTION AND DESORPTION BY NATURAL BENTONITE AND ZEOLITE MINERALS

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Zeolite mineral group is one of the tectosilicates that characterized by three dimensional framework structure with cation exchange capacity (CEC) more than phyllosilicates such as bentonite mineral. The behaviour of K and NH_4^+ with these minerals are important for increasing fertilizer efficiency of K and N. The main objective of this research was to study the sorption characteristics of K^+ and NH_4^+ by bentonite and five zeolite minerals (i.e. analcime, chabazite, phillipsite. and clinoptilolite 1 and 2). Results indicated that K sorption followed the Langmuir equation at two stages. The 1st staged at low concentrations up to 600 ppm K while the 2nd stage at 800-1600 ppm range. Binding energy (E_b) at the 1st stage range from (2.7-14.66) 10^{-2} $l\text{mg}^{-1}$ and the maximum adsorption (b) in the range of 2.23-30.3 mg g^{-1} . At the 2nd stage kd value ranged from (1.3-7.41) 10^{-3} and b value from 18.5259.17 mg g^{-1} . The highest b value was obtained with phillipsite followed by chabazite, bentonite and clinoptilolite 1 and 2. Data of sorbed K indicated that the amount of K extracted decreased with the repeat of the extraction. Phillipsite showed the highest amount of extracted K^+ , while the lowest amount was found with clinoptilolite . Amonium sorption data followed the Freundlich equation where bentonite, chabazite and phillipsite minerals showed more ability to adsorp NH_4^+ . Desorption data indicated that most of the sorbed amonium was extracted in the 1st extraction by KCl. Analcime mineral was capable to retained NH_4^+ in the nonexchangeable form followed by phillipsite and clinoptilolite 1 and 2. We concluded that the ability of zeolites to retain K^+ and NH_4^+ was high and there were differences between the studied minerals in sorption and desorption characteristics. On the other hand bentonite, the most common clay mineral in arid and semiarid regions, showed an intermediate ability between the studied zeolite minerals for K^+ and NH_4^+ sorption.