

Size-adsorption related studies of four Albanian natural clays toward pesticides

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Abstract

The use of natural soil components, such as clays has recently gained increasing interest for their promising properties as adsorbents and pesticide carriers. Four natural Albanian clays (Brari, Currila, Dardha, Prrenjasi) were characterized by granulometric analysis and powder X-ray diffraction. The granulometric analysis performed by Andreasen pipette and Torsion balance techniques were employed to categorize the samples based on their particle sizes and to correlate these parameters to their adsorption behavior toward selected pesticides. Currila and Dardha clays reveal finer textures, consisting mostly of particles with a mean diameter of 2.6 μm . Brari and Prrenjasi clays have a higher percentage of particles with mean diameters varying between 8 and 14 μm . Differential distribution charts show that Andreasen Pipette method reveals better distribution results (fig. 1), especially on the determination of the largest size of particles, which are clearly disregarded by Torsion balance method. The particle size distribution and their content strongly influence the adsorptive capacities of these clays towards selected pesticides.

The adsorption behavior and the adsorption capacity of each clay employed were studied for pesticide concentrations varying below their solubility limit in water. The overall adsorption process in each case is studied by the adsorption isotherm based on Freundlich, Langmuir, Temkin and Dubinin-Radushkevich models for a selected concentration and a variable time as well as for a selected time against variable pesticide concentrations. Aspects of the adsorption kinetics and intra-particle diffusion mechanisms are considered for the elucidation of the adsorption mechanisms.

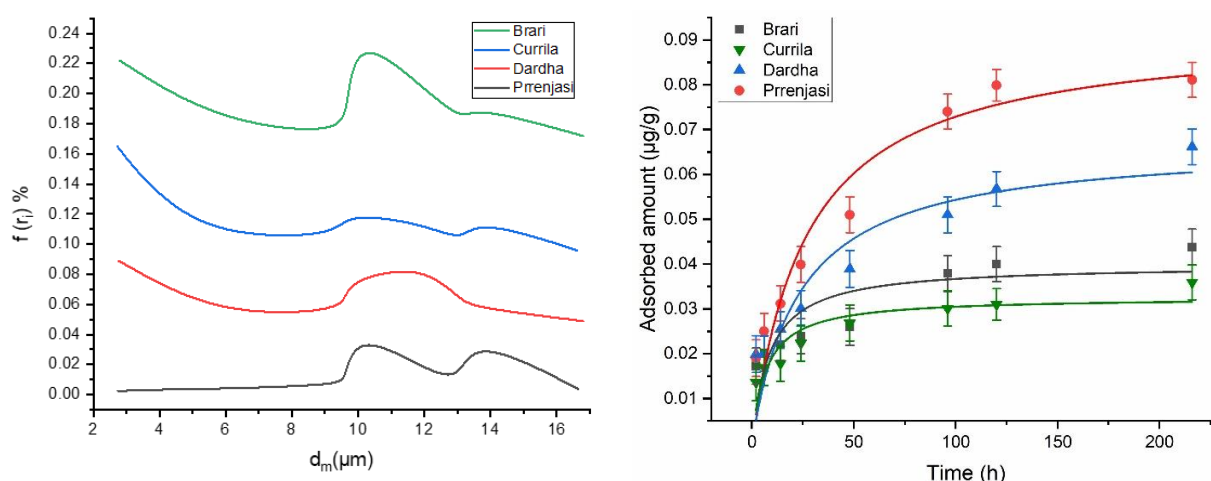


Figure 1: Differential distribution plots for four natural Albanian clays derived by Andreasen pipette analysis (left) and Langmuir adsorption isotherms of endrin (right).