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Adsorption of trace elements by organoclays based on natural layered silicates and humic substances

Natural clays as materials with a number of unique properties have long been widely used as effective sorbents for trace elements in contaminated soils and wastewater. However, the diversity of the composition, structural and textural characteristics of natural clay minerals limits their use in environmental protection practice. This problem can be solved by the modification of layered silicates by organic substances and the synthesis of organoclays with desired properties - increased absorption capacity, selectivity and environmental friendliness.

As part of this research we have studied the sorption of heavy metals by bentonite and kaolinite in the presence of widespread natural organic substances - fulvic acids. Fulvic acids enhanced the adsorption of zinc and lead ions by kaolinite in the acidic pH range (at element concentrations 0.4-4.0 mmol/l). There is a tendency to increase the adsorption by kaolinite with an increase in pH. Fulvic acids increased the adsorption of heavy metals by bentonite only at high concentrations of elements in solution (2-4 mmol/l). Adsorption of heavy metals by clay minerals correlated with the content of natural organic matter in solutions and depends on nature of an element. The sequence of adding cations and fulvic acids to clays also influenced the adsorption value, which indicates complex interaction mechanisms in the systems under study.

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