

Sorption and Desorption of Quaternary Amine Cations on Clays

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The adsorption of organic cations on clays was first studied by Hendricks¹. It has been shown that organic cations are generally preferentially adsorbed over metal cations and that the adsorption of organic cations can be used to measure the cation exchange capacity of the clay² as well as to determine the specific surface area³.

It is well known that the organic cations on the exchange sites render the clay surfaces rather hydrophobic. This property makes the organo-clay attractive to poorly water soluble organic compounds. More recently, several investigators have suggested the application of organo-clay to environmental problems, such as water treatment, spill control, tank and landfill liners, and waster stabilization^{4,5,6}. Before the organo-clay can be successfully used for these environmental problems, however, the following questions must be addressed: 1. How much of the organic cations are being adsorbed on clays and how much are remaining in solution? 2. Are the adsorbed organic cations easily removed from clay surfaces in the presence of excess electrolyte?

The present study was conducted to investigate the sorption and desorption of several quaternary amines on Na and Ca montmorillonite using a titration procedure developed by Furlong and Elliker⁷. Adsorption of amines was conducted at an ionic strength of 0.01 M, and desorption of amines was studied by adding excess electrolyte to increase the concentration of the metal cations tenfold compared with adsorption. We found that the selectivity coefficient for the exchange reaction decreases as the amount of amines added increases. Furthermore, the selectivity coefficient for the desorption process is at least 10 times higher than that for the adsorption process, indicating that the exchange reaction is essentially irreversible.

References

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