
Adsorption of Ethylenediamine (EDA) on Montmorillonite Saturated with Different Cations—III. Na-, K- and Li-Montmorillonite: Ion-Exchange, Protonation, Co-Ordination and Hydrogen-Bonding

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Abstract: Ethylenediamine (EDA) is adsorbed from aqueous solution on Na-, K- and Li-montmorillonite as the monoprotonated cation (EDAH^+) through an ion-exchange process. On washing with distilled water the second amine function is protonated—probably through dissociation of water near the clay surface—and simultaneously formed alkali hydroxide is removed.

In air-dried clay films, prepared from unwashed suspensions, EDA is retained mainly through hydrogen-bonding with water co-ordinated to the exchangeable cation.

EDA adsorbed from the vapour phase is retained through co-ordination, either direct or indirect (i.e. through a 'water-bridge'), depending on the hydration properties of the exchangeable cation. Indirect coordination increases the stability of the amino-clay complex against atmospheric humidity and heating in vacuum in the order $\text{K}^+ < \text{Na}^+ < \text{Li}^+$.

Upon heating co-ordinated EDA is almost completely desorbed, whereas EDAH^+ and EDAH_2^{2+} decompose above 160°C to form NH_4^+ .

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