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# Adsorption of Ethylenediamine (EDA) on Montmorillonite Saturated with Different Cations IV: Al-, Ca- and Mg-Montmorillonite: Protonation, Ion-Exchange, Co-ordination and Hydrogen-Bonding

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**Abstract:** Ethylenediamine (EDA) adsorbed from aqueous solution or vapor phase on Al-, Ca- and Mg-montmorillonite was retained to a more or less large extent in protonated form. The  $\text{NH}_3^+:\text{NH}_2$  ratio decreased with the polarizing power of the mineral exchange cation ( $\text{Al} > \text{Mg} > \text{Ca}$ ) and with increasing amounts of amine fixed. Excess EDA was adsorbed through hydrogen-bonding with protonated species, and partially through co-ordination in vapor treated samples. Co-ordination to the exchangeable cation seemed to be favored in the order  $\text{Al} < \text{Mg} < \text{Ca}$ , and the complexes were stable up to  $200^\circ \text{C}$ . Heating lowered the  $\text{NH}_3^+:\text{NH}_2$  ratio, indicating some deprotonation process caused probably by the competition for protons between EDA and hydrolysed exchange cations. This competition might also account for the rather low quantities of  $\text{NH}_4^+$  produced near  $200^\circ \text{C}$ .

*Clays and Clay Minerals*; November 1975 v. 23; no. 5; p. 343-348; DOI: [10.1346/CCMN.1975.0230502](https://doi.org/10.1346/CCMN.1975.0230502)  
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