

# FACTORS AFFECTING THE RATIO OF CATION EXCHANGE CAPACITY TO CLAY CONTENT IN EAST TEXAS LIGNITE OVERBURDEN

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Unusually high cation exchange capacity (CEC) values relative to clay content are frequently reported by commercial laboratories for lignite overburden and minesoil in Texas. The CEC:%clay ratio is commonly greater than one. Current regulatory criteria require mining companies to provide an explanation and/or reanalyze samples when the CEC:%clay ratio exceeds one. No definitive explanation for ratios greater than one has been reported.

The methods used by commercial laboratories for the determination of clay and organic C content were evaluated. A comparison of the methods of particle size distribution determination suggests that the major reason lignite overburden samples have CEC:%clay ratios greater than one is incomplete dispersion of aggregates of clay minerals or shale fragments. The method used by commercial laboratories underestimates clay content by approximately 24%. Another important factor influencing CEC:% clay ratio was the presence of organic materials (lignite) in the samples. Lignite may make a significant contribution to CEC in overburden materials. In a study designed to investigate the pH dependent charge of both the mineral and organic fractions the CEC of overburden organic constituents was determined to be approximately  $158 \text{ cmol}_c \text{ kg}^{-1}$ .

A mineralogical investigation that included X-ray diffraction analysis, computer simulation, identification of high charge smectites by the alkylammonium method, and scanning electron microscopy was undertaken. This investigation revealed the presence of high charge smectite in the clay fraction of lignite overburden. However, this mineral was not a major contributor to the unusually high CEC:%clay ratios. Shale fragments, smectite, and partially weathered mica were discovered in the silt fraction. The silt fraction may therefore provide a "hidden" source of CEC.

The high CEC:%clay ratio problem in east Texas lignite overburden and minesoils may be resolved by adjusting methods for percent clay determination to optimize dispersion and by accounting for CEC due to organic materials. An alternative approach is to use current methodology and utilize correction factors to account for incomplete dispersion of clay minerals and the charge contributions of organic materials.

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