
Mineralogical Transformations during Weathering of Lignite Overburden in East Texas

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Abstract: Mineralogical weathering sequences in sediments overlying lignite beds were investigated in a core (27 m deep) from Calvert, Robertson County, northeast Texas. Weathering trends were evaluated based on the properties and relative distributions of both the expandable and non-expandable minerals. The sulfide minerals in these sediments are the most susceptible to weathering and were only observed in the unaltered (reduced) zone below 7 m. Oxidation of the sulfides has resulted in the formation of jarosite and gypsum in the upper 7 m of the core (oxidized zone). The oxidized zone is further characterized by reddish brown colors (high chroma), a greater quantity of dithionite-extractable iron, and absence of chlorite. Although the major clay minerals in these sediments (smectite, kaolinite, mica) are largely detrital, weathering has resulted in an increase in the content of kaolinite and a decrease in the content of mica towards the surface. The mica appears to have altered to a high-charge smectite characterized by basal spacings of 32Å after intercalation with octadecylammonium cations. The high-charge smectite is most abundant in the soil horizons at the top of the core and gradually decreases with depth. A low-charge smectite is the most abundant species in the unweathered parent sediments and increases with depth.

Key Words: Lignite • Oxidation • Reclamation • Smectite • Soil • Weathering

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