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# Saponite from the Emet Colemanite Mines, Kütahya, Turkey

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**Abstract:** Clay mineralogy and whole-rock chemistry of the borate-bearing layers of the Hisarcik and Esbey mines were examined. The Hisarcik clays occur as laminated or unlaminated clay layers with sharp contacts. Unlaminated layers contain quartz derived from metamorphic rocks and carbonate fragments in a clay matrix, and are interpreted as reworked tuffs deposited in playa-lake environments. An important feature is that the unlaminated clays contain little MgO (3– 15 wt. %) as compared with the laminated clays (15– 30 wt. %). As previous studies have shown, the clay fraction of the studied profile contains predominantly Li-bearing saponite, and accounts for 60– 90 wt. % of the clay fraction (<2 µm). Illite in the clay fraction varies from 0 to 67 wt. % and the average illite percentage never exceeds 40 wt. %. Chlorite is scarce (2– 5 wt. %). Illite-smectite interstratified clays (illite at 70%, smectite at 30%) were only found in low concentrations in the laminated clay layers of the upper limestone unit (above the borate zone), where illite-2M of detrital origin is also present. The Esbey clays occur interstratified with colemanite layers and envelope colemanite nodules. Calcite is the major mineral of the clays whereas quartz, plagioclase, feldspar, colemanite, and cahnite are minor components. The MgO contents vary between 4.70– 13.95 wt. % in the clays interstratified with colemanite layers, between 7.24– 11.89 wt. % in the enveloping clays, and between 10.27– 21.25 wt. % in clays located above the colemanite zone. The composition of the clay fraction (<2 µm) in all samples is similar. Smectite represents between 40– 90 wt. % of the clay fraction in the upper portion of the stratigraphic profile and decreases towards the lower part of the stratigraphic profile. Smectite always occurs with illite which may vary from 20 to 90 wt. % of the clay fraction, and a small amount of kaolinite and chlorite. Illite-2M polytype is abundant. The *d*(060)-reflection position suggests that the smectite minerals from the Hisarcik and Esbey colemanite mines contain both dioctahedral and trioctahedral smectites to form a transitional zone. These smectites are a product of a magnesium-rich alkaline playa-lake environment.

**Key Words:** Colemanite • Emet • Esbey • Hisarcik • Saponite • Trioctahedral Smectite

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