
Hydrothermal Reactivity of Saponite

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Abstract: Saponite crystallizes from amorphous gel having an ideal saponite composition within 7 days at all experimental temperatures between 300° and 550° C at 1 kbar pressure. Reactions subsequent to this initial crystallization vary in type and degree, depending on the temperature of reaction and the type of interlayer cation. Above 450° C the initially crystallized K-saponite dissolves, and talc and phlogopite nucleate and grow as discrete phases. At 450° C the initial K-saponite reacts to form talc and phlogopite layers, but the reaction proceeds via intracrystalline layer transformations rather than via dissolution and precipitation, producing a mixture of fully ordered, interstratified talc/saponite and fully ordered saponite/ phlogopite. The K-saponite shows subtle signs of reaction at 400° C after 200 days: this temperature is at least 150° C lower than experimental reaction temperatures previously reported for saponites. No reactions beyond the initial crystallization of saponite were observed below 400° C. K-saponite reacts more rapidly than either Na-saponite or Ca-saponite above 400° C and the Na-saponite and Ca-saponite produce no mica layers during their transformation to mixed-layer clays. Interstratified talc/saponite formed in the Na-saponite system, and the Ca-saponite system produced both talc/saponite and chlorite/saponite.

Key Words: Chlorite/saponite • Hydrothermal stability • Potassium • Saponite • Saponite/phlogopite • Talc/saponite

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