

## **Hydration and swelling of synthetic Na-saponites: Influence of layer charge**

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### **ABSTRACT**

This paper concerns the hydration and swelling behavior of four synthetic sodium saponite samples with general formula  $\text{Na}_x(\text{Si}_{4-x}\text{Al}_x)(\text{Mg}_3\text{O}_{10}(\text{OH})_2)$ , where  $x = 0.4, 0.5, 0.6,$  and  $0.7$ . The combination of gravimetric water adsorption measurements and X-ray diffraction experiments under controlled water pressure allows us to analyze the influence of layer charge on swelling mechanisms. When the layer charge increases, swelling occurs for lower values of the chemical potential, i.e., at lower relative pressure. In parallel, as the cohesion between layers increases with increasing layer charge, a greater amount of water is needed to initiate swelling for higher-charged samples. In this last case, due to the proximity of interlayer cations, the transition between the one layer and two-layer hydrate occurs before the sodium cations are surrounded by a complete hydration sphere. This study also shows that the “one-layer” or “two-layer” hydrates cannot be considered as defined states as they appear to be modified with both layer charge and relative pressure.