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Quantitative XRD analysis: tools to investigate link between hydrous strain and CEC in the case of Me-exchanged Montmorillonite

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This work aims at examining, by quantitative XRD analysis, the effect of an applied hydrous strain in the cationic exchange process of a dioctahedral smectite (Na-rich montmorillonite SWy-2). The hydrous constraint was created by a continuous, in situ, hydration-dehydration cycles using a variation of the %RH rate [1]. Respectively, The starting, the intermediate and the final stressed samples was deposed in contact with saturated Me^{2+} (i.e. Cd^{2+}, Co^{2+}, Zn^{2+} and Ni^{2+}) chloride solutions respectively in order to examine the effect of the retained materials stress on the CECof the host materials. An XRD profile modelling approach is adopted to describe all structural changes created by the environmental evolution of the %RH rate. This investigation allowed us to determine several structural parameters related to the nature, abundance, size, position and organization of exchangeable cation and water molecule in the interlamellar space along the c* axis [2]. The obtained qualitative results show a considerable change in the hydration behaviour, versus the number of hydration –dehydration cycle, from homogeneous “2W” to heterogeneous “1W-2W” hydration state indicating an interstratified hydration phases and due probably to a new organization of the interlamellar space content. Quantitatively, the theoretical Mixed Layer Structure MLS suggest the coexistence of more one “crystallite” specie. Which are saturated by more than one exchangeable cations, indicating a partial saturation of all exchangeable sites. Using optimum structural parameter values, deduced from XRD modelling profile approach, some equations which described the evolution of exchangeable cation amount versus the applied hydrous strain were derived.