# Implication of water phase condition on the K-, Nitrogen and La- smectite-muscovite transition under high pressure and application for subduction processes

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The lithospheric mantle is depleted in incompatible elements and basically anhydrous or nearly anhydrous. However, in subduction zones, smectite is one of the most important minerals that could bring together volatiles elements and trace elements into the mantle promoting re-hydration and trace element enrichment. However, in order to be considered efficient, smectite must resit to pressure and temperature or must transform into other phases able to bring such elements to the mantle. Our group is developing phase diagrams under high pressure and temperature (HPHT) in K-, nitrogen- ($NH_4^+$) and La-doped smectite in order to understand the smectite-illite (or muscovite) transformation. Current results shows that La-smectite is stable under pressures of 2.5GPa, 4.0 and 7.7GPa at temperatures up to 250°C, ~300°C and 350°C, respectively, above which they transform into a La-muscovite-like structure, being irreversible in such conditions. K-, $NH_4^+$- smectite, however, are stables at temperatures around 250° C, independently of any pressure. Above this, they transforms into a I/S structure previously to changing into a muscovite structure at ~450°, 350° and ~300°C, under 2.5, 4.0 and 7.7GPa, respectively. These results show that pressure does not affect the stability of K- and $NH_4^+$- smectite, which remain stable up to 250°C under pressures up to 7.7GPa. On the other hand, higher pressures enlarge smoothly the La-smectite stability field in a very limited extension. Transformation of La-smectite into muscovite occurs directly, but K- and $NH_4^+$-smectite transformation occurs via I/S structure. La-smectite/muscovite transformation is in perfect agreement with high pressure ice/water transformation. However, K-and $NH_4^+$-smectite does not have such straightforward influence, due to the existence of the I/S stability field.