A (1:1) 7-Å Fe Phase and its Transformation in Recent Sediments: An HRTEM and AEM Study

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Abstract: Young marine green grains, from Fe-rich sediments, were studied by using HRTEM systematically combined with punctual microchemical EDX analyses. Experimental results demonstrated these grains were made of a mixture of very small phases (mainly 1:1 and 2:1 silicates layer phases) with a dominant 7-Å Fe specie. All the main crystallochemically characterized phases appeared intimately related in the same evolutionary process. Each of them experienced different and well described conversion mechanisms. So first, a starting original Fe-rich kaolinite recrystallized via solution into another particular 7-Å Fe-rich phase, the composition of which varies from a di-tri to a pure trioctahedral (Mg + Fe) end member.

This Fe-rich 1:1 mineral is effectively not a classical one. Then crystallization of a 10 Å, rather dioctahedral K-rich phase occurs at the expense of it, through 1:½:1 interstratified structures. Such an evolution takes place through a solid state mechanism in which one 10-Å layer replaces one 7-Å layer. Another part of mica-like structures may also directly develop after dissolution of original kaolinites. The development of 10-Å K-rich phases could be significative of the beginning of the glauconitization process in these grains.

Key Words: 7-Å Fe phase • 10-Å phyllosilicates • AEM • HRTEM • Marine sediments • Phase transformation

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