
Determination of Structural Defects in Phyllosilicates by X-Ray Powder Diffraction—II. Nature and Proportion of Defects in Natural Kaolinites

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Abstract: Until now, the different attempts to describe the defects of kaolinites were based on the ideas that (i) the hkl reflections with $k = 3n$ are Bragg reflections, while (ii) the hkl reflections with $k \neq 3n$ are affected by $\pm \mathbf{b}/3$ translations or $\pm 2\pi/3$ rotations. With regard to this conception, this work provides several important precisions: (i) The $h, 3n, l$ reflections are true continuous diffraction bands, more or less modulated, and disturbed by the existence, in the stacking, of random shifts parallel to the layer plane. (ii) The major defect in natural kaolinites is not the $\pm \mathbf{b}/3$ translation, but the displacement from one layer to the other (or from one domain to another in the same layer) of the Al vacancies. (iii) The model containing true rotation of layers should be rejected because it does not allow us to interpret all the different parts of the experimental diagrams. Such a concept of defects in kaolinites is in agreement with the existence of polytypes of kaolinite, with the presence of twins, and allows us to interpret some physico-chemical properties such as the infrared spectra.

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