Fe-Speciation in Kaolins: A Diffuse Reflectance Study

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Abstract: Diffuse reflectance spectra of kaolins have been recorded in samples from different environments. They show the systematic presence of Fe-oxides, even in bleached kaolins, with no contribution from the Fe^{3+} ions substituted in kaolinite. Second derivative spectra of various Fe-phases (hematite, goethite, lepidocrocite, maghemite, akaganeite, ferrihydrite and Fe-polymer) may be differentiated by the position of a diagnostic band corresponding to the $2(^6A_1) \rightarrow 2(^4T_1(^4G))$ transition. The systematic comparison of diffuse reflectance spectra of unbleached and bleached kaolins has demonstrated the differences between the Fe-oxides occurring as coatings and as occluded phases. The features observed in second derivative spectral curves are consistent with assignments of crystal field transitions to goethite, hematite, akaganeite, and aged hydrous ferric oxides. The optical determination of the Fe-phases associated to kaolins assists in the interpretation of the formation conditions of these minerals.

Key Words: Diffuse reflectance spectroscopy • Fe-speciation • Kaolin • Second derivative spectra

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