
Mineralogical Interference on Kaolinite Crystallinity Index Measurements

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Abstract: This study examines the influence of minerals and amorphous phases associated with kaolin and kaolinitic rocks on kaolinite crystallinity indices (KCI) derived from X-ray diffraction (XRD) data in order to select the best index for systematic studies of commercial kaolins or geological sequences. For this purpose, 8 kaolins of differing structural order were chosen and used to prepare mixtures containing different weight fractions of quartz, feldspar, illite, smectite, chlorite, halloysite and iron hydroxide and silica gels. An additional 17 samples of kaolin were also studied to test the results and evaluate the restrictions. KCIs used included Hinckley (HI), Range and Weiss (QF), Liènard (R2), Stoch (IK), Hughes and Brown (H&B) and Amigó et al. (full width at half maximum, FWHM), and the "expert system" of Plançon and Zacharie.

Based on more than 15,000 KCI determinations, the HI and QF are influenced by quartz, feldspar, iron hydroxide gels, illite, smectite and halloysite. IK can be used in the presence of quartz, feldspar and iron hydroxide and silica gels. Also, R2 is the only KCI that could be measured in the presence of halloysite; FWHM indices should not be used in the presence of chlorite and/or halloysite; and H&B should only be used with pure kaolinite samples. The "expert system" of Plançon and Zacharie is strongly affected by the presence of other mineral phases, particularly with more than 25% of well-ordered kaolinite. Their system is less sensitive to other mineral phases when only disordered kaolinite is present, and it should not be used with kaolinite of medium order-disorder because the well-ordered phase is present in an inappreciable proportion (< 10%). KCI is only measurable in kaolinitic rocks if kaolinite is >20 wt% and the precision increases with an increase in the quantity of kaolinite. In all cases, the reliability will depend on the other minerals present. When a KCI can be measured accurately, the others can be obtained by using the empirical relationships reported in this paper.

Key Words: Kaolinite Crystallinity Index • Mineralogical Interferences

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