The Lorentz-Polarization Factor and Preferred Orientation in Oriented Clay Aggregates

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Abstract: A closed-form equation was derived that describes the powder-ring distribution factor as a function of 2θ, soller slit collimation, and σ^*, which is defined as the standard deviation of an axially symmetrical Gaussian orientation function. Methods were developed for measuring σ^* in the reflection mode by means of a $\theta/2\theta$ diffractometer. Six experimental arrangements for a sedimentary chlorite showed widely different intensity ratios of the 001/005 reflections and gave a standard deviation of $\pm 5.8\%$ when corrected by the theory. The absolute integrated intensities of the 003 reflection from eleven illite samples provided an eight-fold maximum range which, when corrected, yielded a standard deviation of $\pm 7.7\%$.

The intensity distributions within each of two X-ray powder diffraction patterns obtained from instruments with different soller-slit configurations could not be directly compared at low diffraction angles unless corrections, based on σ^*, were introduced to allow for the differences in axial divergence.

Key Words: Chlorite • Illite • Intensity distribution • Lorentz factor • Orientation • Soller slits • X-ray powder diffraction