
Quantitative Clay Mineralogical Analyses from the Bulk Chemistry of Sedimentary Rocks

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Abstract: A technique suitable for computer application has been developed whereby whole rock major element analyses are corrected for X-ray detectable nonclay minerals and used to set up simultaneous equations which are solved to give clay mineral abundances. A theoretical evaluation of the approach by graphical methods enables the intrinsic errors to be very clearly assessed. Errors are minimized when SiO_2 , Al_2O_3 , and K_2O are used as variables but only slightly increased if total $\text{Fe}_2\text{O}_3 + \text{MgO}$ is substituted for SiO_2 . Quartz and CO_2 content are the only data normally required which cannot be determined by X-ray fluorescence.

Results compare favorably with estimates obtained by XRD and other methods, being more accurate than XRD and equally precise provided the rock does not contain clay minerals other than the kaolin group, the mica group, and chlorite. Errors are large when the clay mineral phases comprise more than 35% chlorite and as yet undetermined when smectite exceeds 10%.

The method is ideally suited to the analysis of large numbers of mudstones of fairly similar mineralogy especially where XRF equipment with direct output to a computer is available.

Key Words: Mudstones • Sedimentary

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