Mineralogical Analysis by Nuclear Magnetic Resonance Spectroscopy. (S09-beard172135-Oral)

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Abstract:

Solid-state NMR spectroscopy provides an enormous amount of molecular and structural information about clay minerals and solids in general. But, it is a challenge to acquire highly resolved solid-state information because spectral broadening occurs as a result of dipole-dipole interactions. This problem has been overcome to a large extent by the development of techniques, experiments, and pulse sequences that are widely used throughout the solid-state NMR community. High-resolution NMR has been found to be applicable to the study of clay minerals using 29-Si- and 27-Al-NMR. For example, the degree of silicon substitution by aluminum has been determined by the nature of 29-Si chemical shift values, and distinct peaks have been observed for kaolinite, nacrite, and dickite. 27-Al-NMR has distinguished tetrahedrally and octahedrally coordinated Al in both mica and montmorillonite. In addition, solid-state NMR has also been used to study bound cations and water. In this paper, the basics of NMR instrumentation and experimentation, sample preparation, instrument calibration, and data acquisition, analysis, and interpretation will presented within the framework of Methods of Soil Analysis.

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