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Use of fast field cycling NMR for the evaluation of the interactions between natural organic matter and clay minerals

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Natural organic matter (NOM) is a very important soil and water constituent due to its role in binding organic and inorganic pollutants, thereby affecting their fate in the environmental compartments. Prediction of NOM physical-chemical properties can be efficaciously achieved by studying its structure and three dimensional conformation. Many techniques can be used to this aim. Among others, fast field cycling nuclear magnetic resonance relaxometry (FFC-NMR) appears very suitable due to its ability in monitoring NOM conformational behaviour at very low magnetic fields. The present study aims to the evaluation by FFC-NMR relaxometry of the interactions between a dissolved humic material and two clay minerals. In particular, FFC-NMR showed that either kaolinite or montmorrillonite adsorb part of the organic material. Absorption degree is proportional to the surface area of the two clay minerals, while the adsorbed fraction resulted the most polar part of dissolved organic matter due to the disappearing of the components relaxing at the longest longitudinal relaxation times. This study showed that FFC-NMR is more sensitive than high field NMR spectroscopy in monitoring the conformational changes occurring during the interactions between natural organic matter and clay minerals.

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