



Spectral Induced Polarization Signature of Soil Organic Matter

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Although often composing a non-negligible fraction of soil cation exchange capacity (CEC), the impact of soil organic matter (OM) on the electrical properties of soil has not been thoroughly investigated. In this research the impact of soil OM on the spectral induced polarization (SIP) signature of soil was investigated. Electrical and chemical measurements for two experiments using the same soil, one with calcium as the dominant cation and the other with sodium, with different concentration of OM were performed. Our results show that despite the high CEC of OM, a decrease in polarization and an increase in relaxation time with increasing concentration of OM is observed. For the soil with calcium as the dominant cation, the decreases in polarization and the increase in relaxation time were stronger. We explain these non-trivial results by accounting for the interactions between the OM and the soil minerals. We suggest that the formation of organo-mineral complexes reduce ionic mobility, explaining both the decrease in polarization and the increase in relaxation time. These results demonstrate the important role of OM on SIP response of soil, and call for a further research in order to establish a new polarization model that will include the impact of OM on soil polarization.