

**Title**

On the Use of 31-P NMR Spectroscopy to Determine Chemical Forms of Phosphorus in Soils.

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**abstract**

In agricultural areas, non-point source contamination of surface and ground water by phosphorus (P) and nitrogen (N) poses a severe threat to water quality. The most common form of phosphorus in soils is inorganic phosphate, the mobility and bioavailability of which are mostly determined by surface reactions with iron and aluminum (hydr)oxides. Despite extensive past research, basic reactions are still not totally understood on a molecular level. In this study, the sorption reactions of phosphate to the common aluminum mineral gibbsite are investigated. The structure and bonding environment of phosphate sorbed under different reaction conditions are examined using CP-MAS 31P-NMR as a molecular spectroscopic technique. An attempt is made to identify the species responsible for the increasing stability of phosphate at the surface. These results could have significant implications concerning the mobility and stability of P in the soil environment.

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