

Phosphate complexation on maghemite using *in situ* ATR-FTIR: pH effects

JUNHO HAN, JEONGSUK JUN, SEOYEON LEE,
JAEWON JUNG, HEE-MYONG RO*

Seoul National University, Seoul, 08826, Republic of Korea (*correspondence: hmro@3snu.ac.kr)

Introduction and methods

Many studies have attempted to reveal the configuration of phosphates on iron (hydr)oxides; however, it is still controversial since iron oxides exist in various forms and under various environmental conditions [1-4]. We therefore identified the configuration of phosphates on maghemite (Sigma-aldrich, USA) by changing the solution pH conditions using *in situ* ATR-FTIR (Shimadzu, Japan) equipped

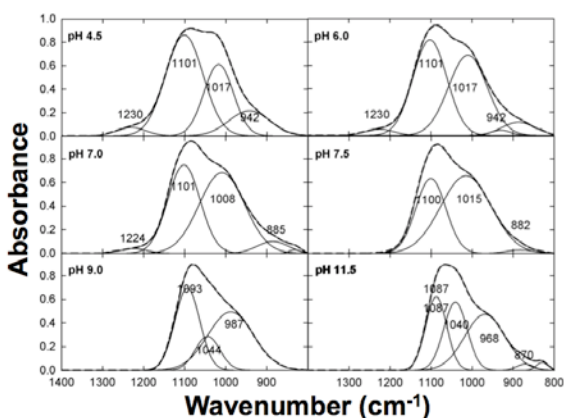


Figure 1: ATR-FTIR spectra of complexed phosphates on the surface of maghemite at pH from 4.5 to 11.5.

with DTGS detector and 45° ZnSe HATR (Pike tech., USA).

Result and discussion

The IR absorption bands appeared at 1230, 1101, 1017 and 942 cm^{-1} at pH 4.5, and they corresponded to P-OH bending, $\nu(\text{P}=\text{O})$, $\nu(\text{P}-\text{OFe})$ and P-OH shoulder, respectively [2-4]. The phosphate complexation on maghemite was readily transformed from the inner-sphere (IS) monodentate non-protonated complex to the IS bidentate complex above pH 6. Bidentate complexation was the dominant mechanism of phosphate immobilization under the optimum pH for plant.

[1] Carabante & Grahn (2010) J. Colloid Interface Sci. **351**, 523-531. [2] Kubicki et al. Langmuir, **28**, 14573-14587. [3] Waiman et al. J. Colloid Interface Sci. **394**, 485-489. [4] Yang et al. (2016), ESNT, accepted.