Electronic Supplementary Material (ESI) for Energy & Environmental Science

Supporting Information

Phosphate Adsorption on the Iron Oxyhydroxides Goethite (α-FeOOH), Akaganeite (β-FeOOH), and Lepidocrocite (γ-FeOOH): a ^{31}P NMR Study

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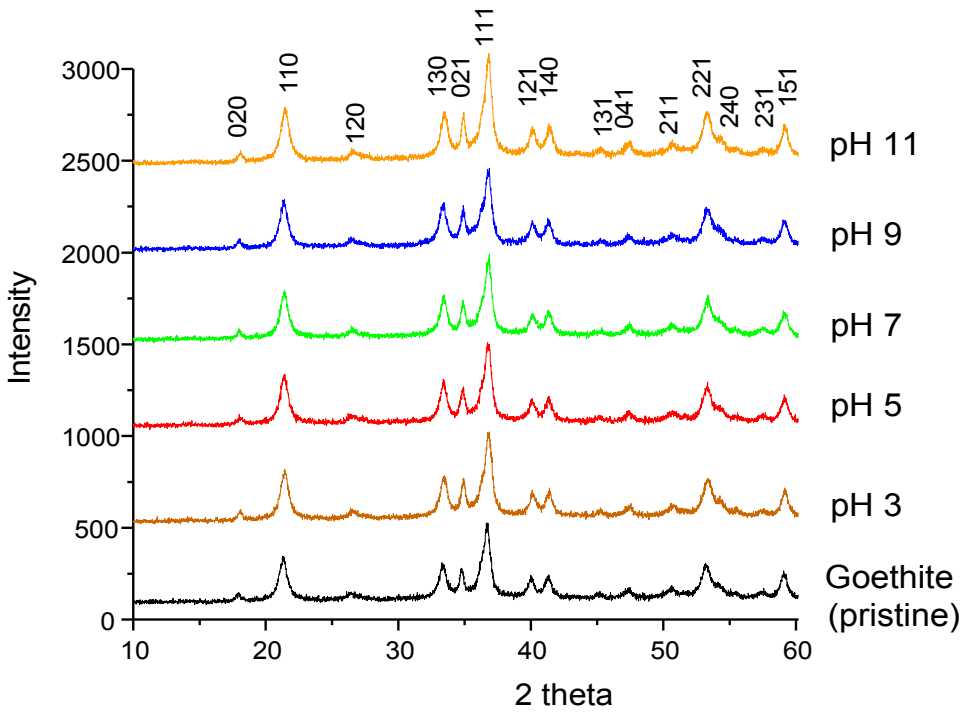
(a)



(b)

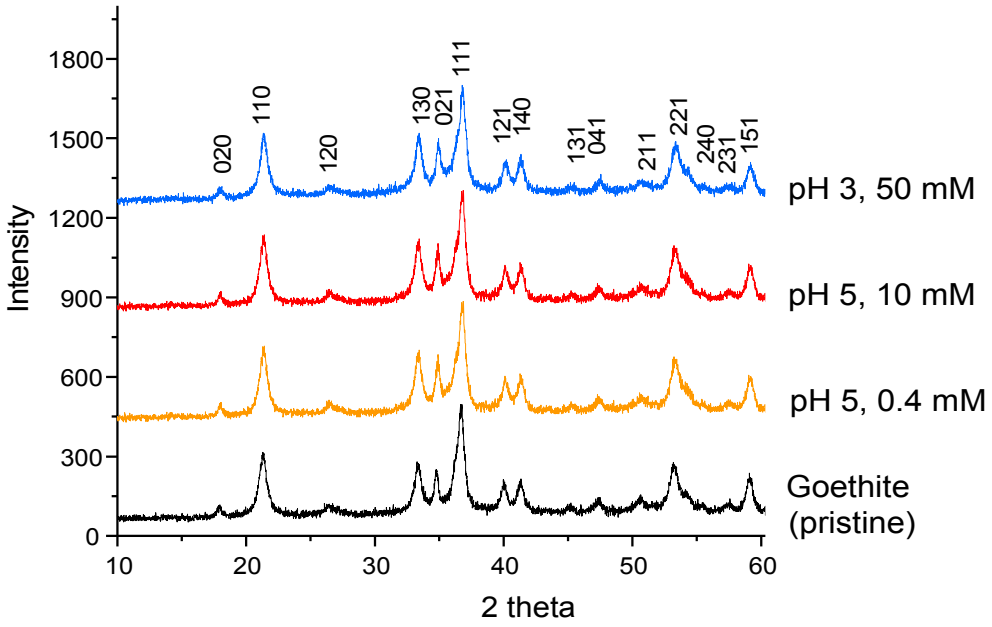


Figure S1. X-ray powder diffractions for phosphate-adsorbed goethite samples (a) at 1mM initial phosphate concentration as a function of pH and (b) at various pH values and initial concentrations.

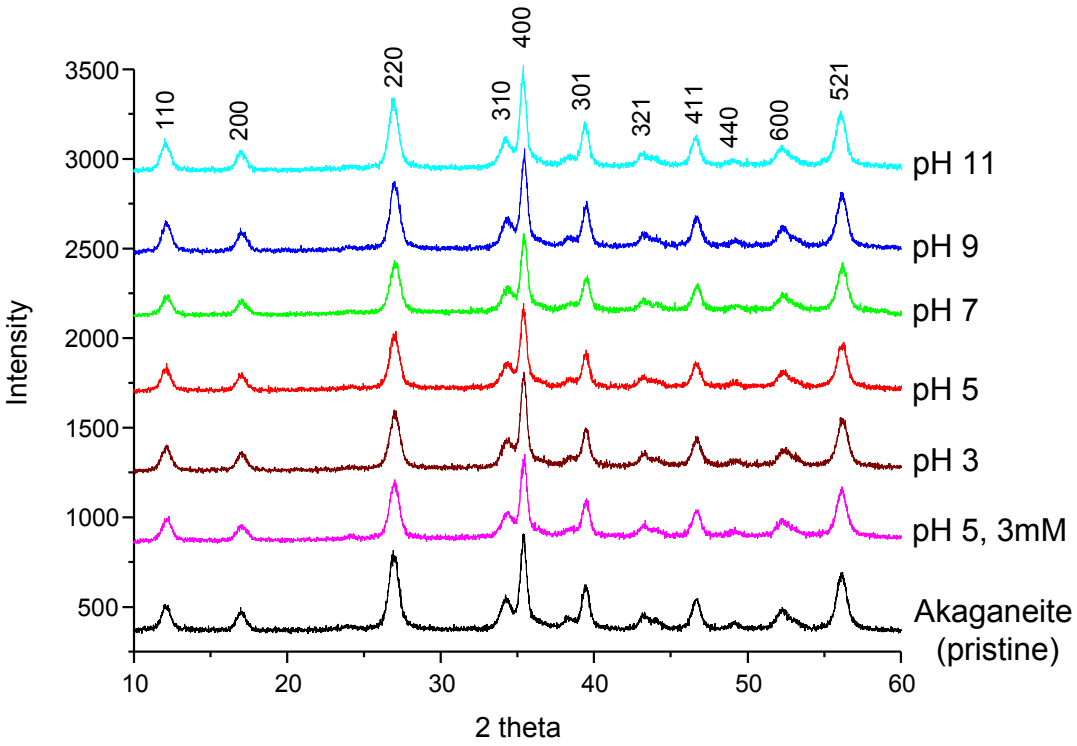


Figure S2. X-ray powder diffractions for phosphate-adsorbed akaganeite samples at a 1mM initial phosphate concentration as a function of pH, and at a 3mM initial phosphate concentration and pH 5.

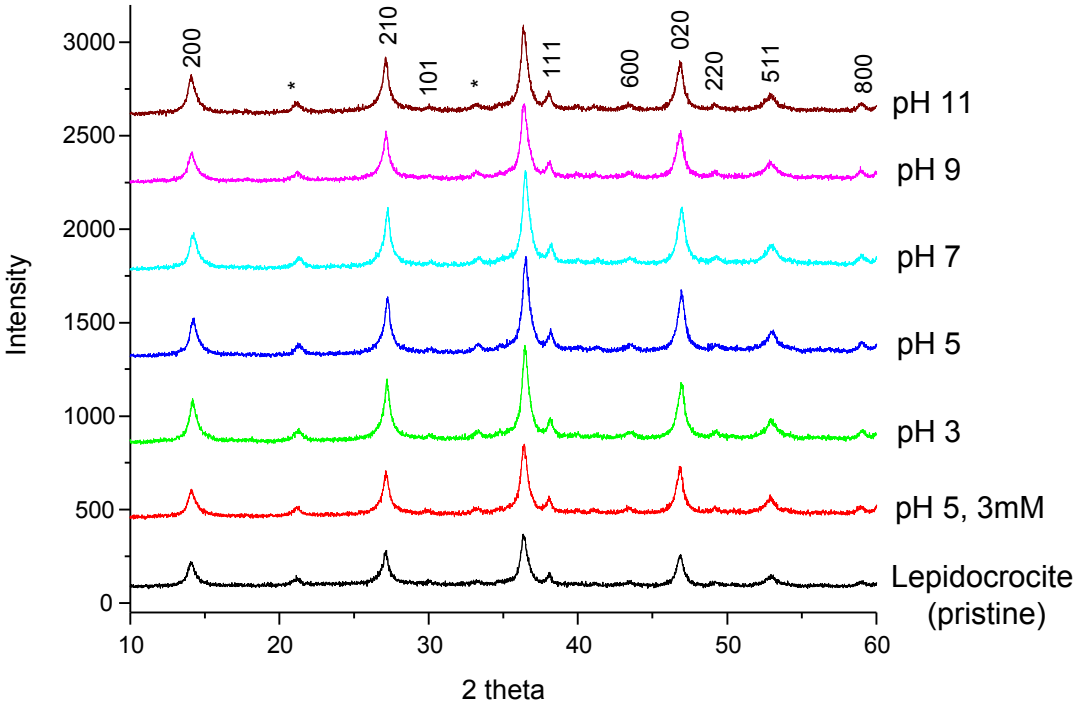


Figure S3. X-ray powder diffractions for phosphate adsorbed lepidocrocite samples at a 1mM initial phosphate concentration as a function of pH and at a 3mM initial phosphate concentration and pH 5. (*) denotes the reflection due to the goethite impurity, present in all the samples.

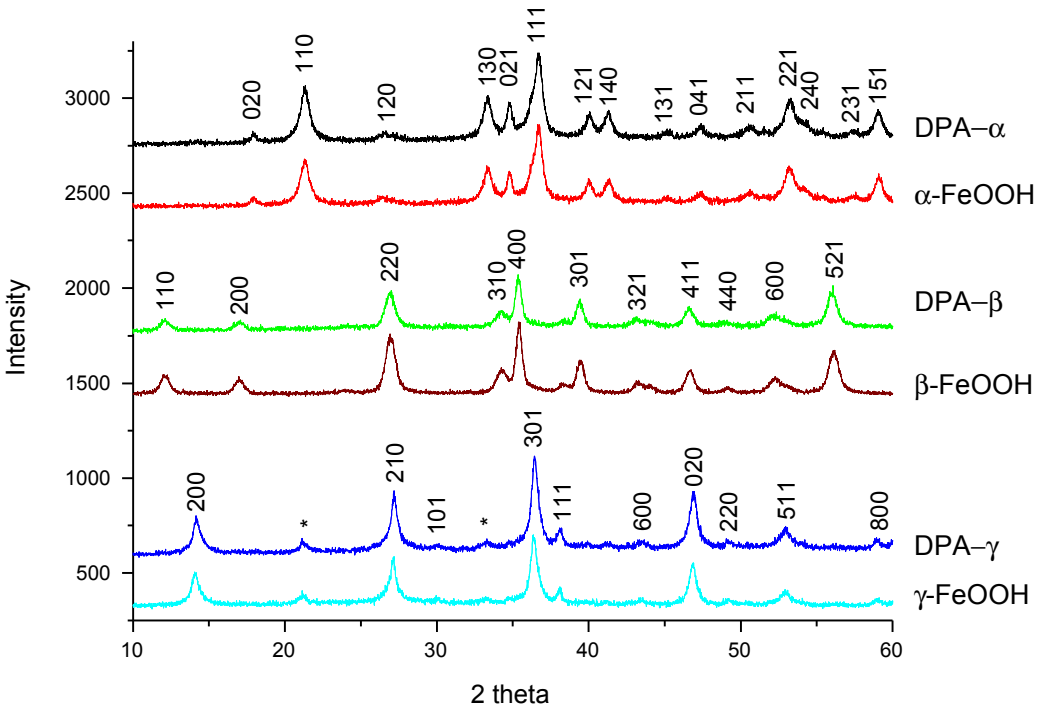
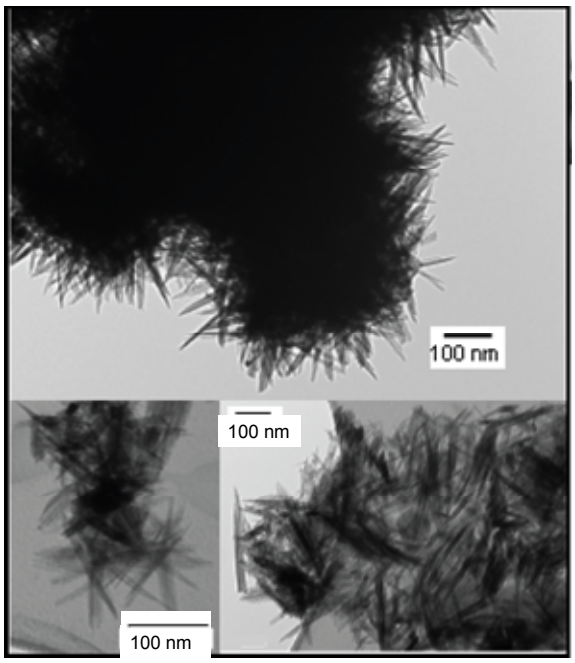


Figure S4. X-ray powder diffractions for dimethyl phosphinic acid (DPA) adsorbed FeOOH samples at a 10 mM initial phosphate concentration and pH 5. (*) denotes the reflection due to the goethite impurity. The DPA-sorbed goethite, akaganeite, and lepidocrocite samples were labeled as DPA-α, DPA-β, and DPA-γ, respectively.

(a)



(b)

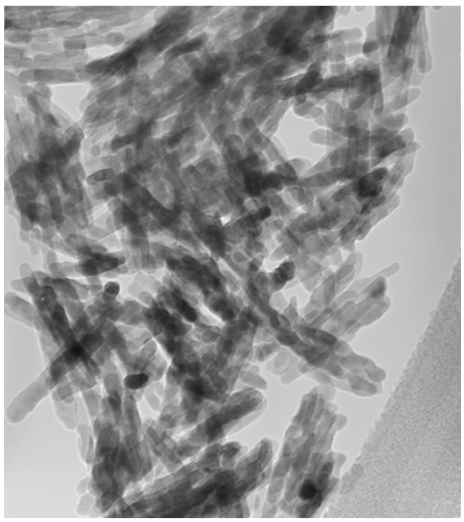


Figure S5. Transmission Electron Microscope (TEM) images of (a) goethite and (b) akaganeite.

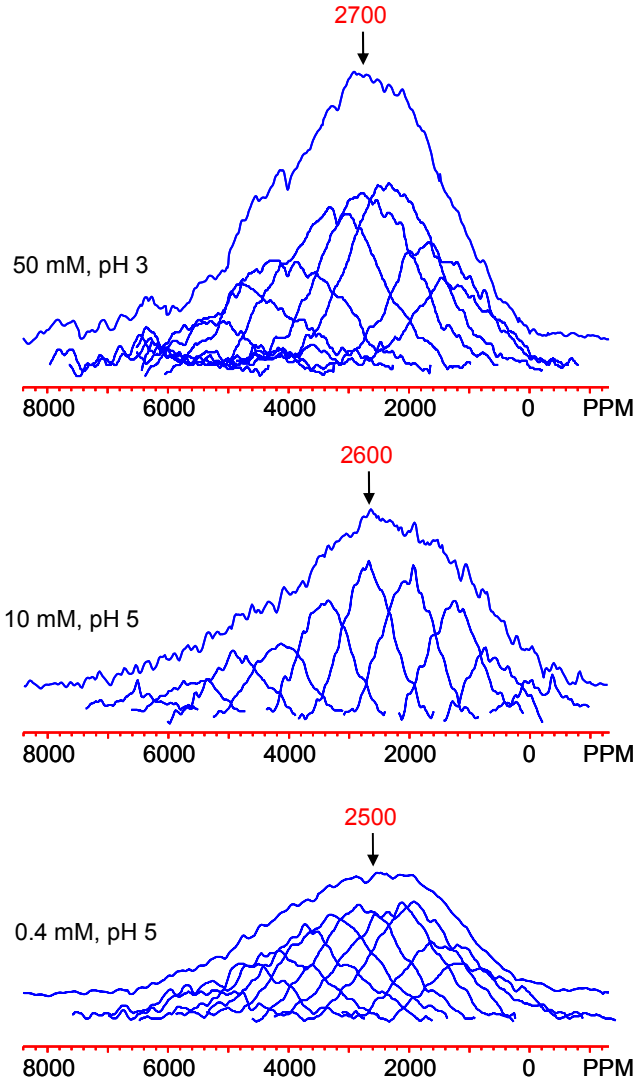


Figure S6. Spin echo mapping ^{31}P NMR spectra of phosphate-adsorbed goethite at various phosphate concentrations and pH. The NMR spectra of 0.4 and 10 mM samples are normalized according to the number of scans (free induction decays) used to acquire each individual spectrum.

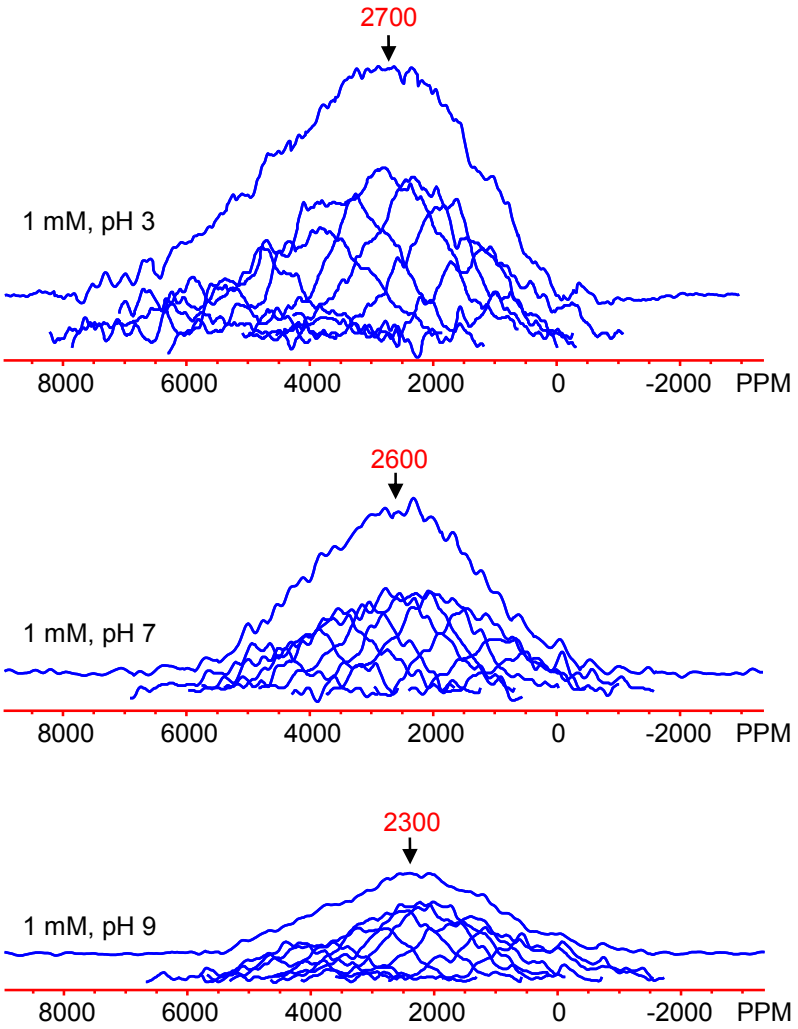


Figure S7. Spin echo mapping ^{31}P NMR spectra of phosphate adsorbed goethite at a 1mM phosphate concentration as a function of pH. The NMR spectra have been normalized according to the number of scans used for each experiment.

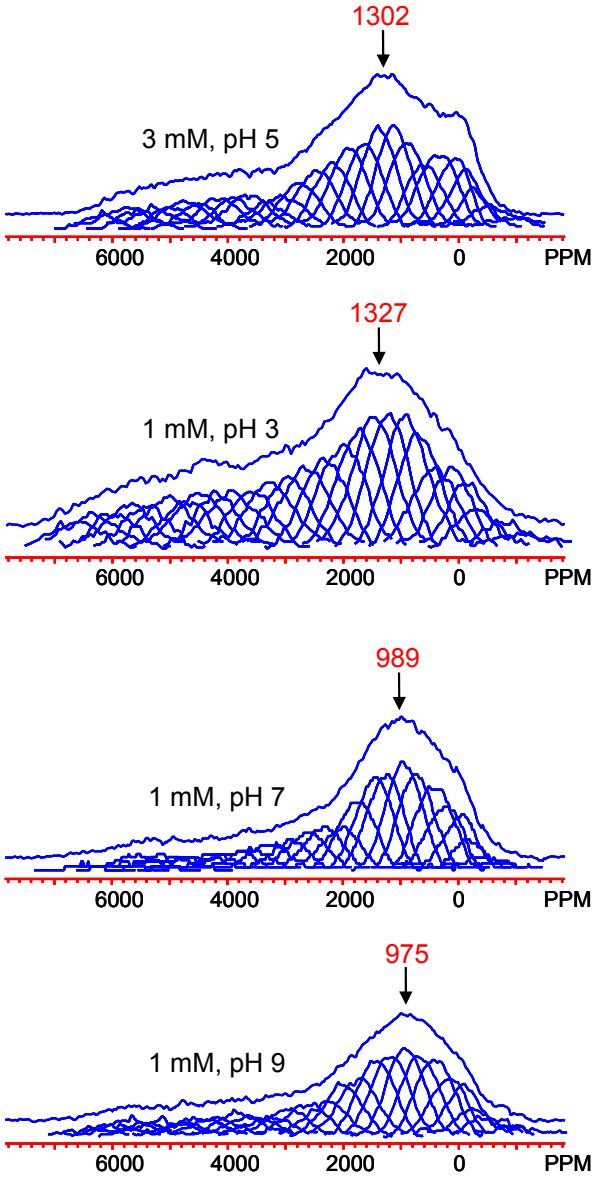


Figure S8. Spin echo mapping ^{31}P NMR spectra of phosphate adsorbed akaganeite at a 3mM phosphate concentration and pH 5 and as a function of pH at a 1mM phosphate concentration. The NMR spectra, except for pH 3 sample, are normalized.

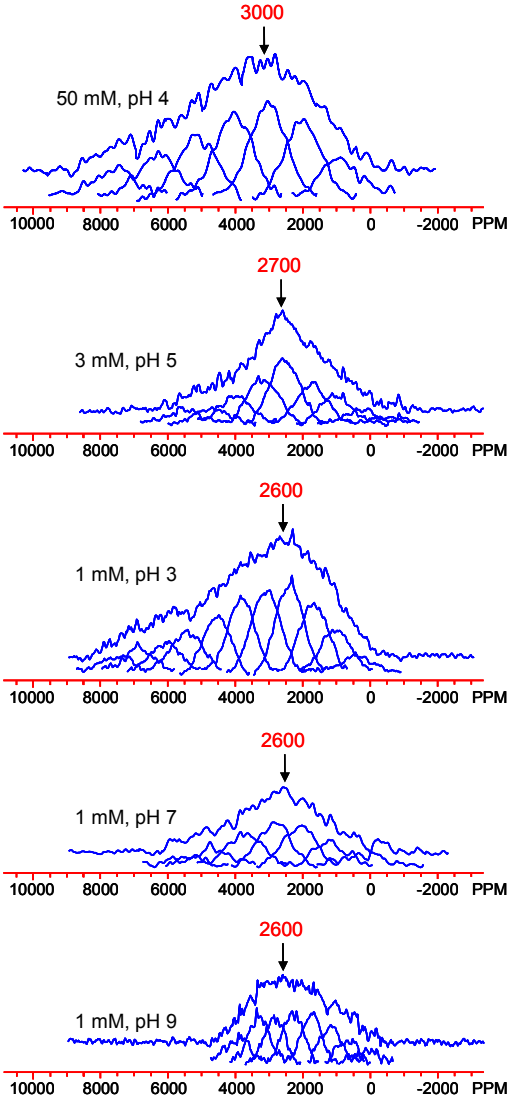


Figure S9. Spin echo mapping ^{31}P NMR spectra of phosphate adsorbed lepidocrocite at pH 4 and 50 mM initial phosphate concentration, pH 5 and 3mM initial phosphate concentration, and 1mM phosphate concentration as a function of pH. The NMR spectra, except for 50 and 3 mM samples, are normalized.