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## Competition of monomeric and polymeric silicic acid with natural organic matter for binding sites at goethite

Jana Dobritzsch<sup>1</sup>, Anika Klotzbücher<sup>1</sup>, Thimo Klotzbücher<sup>1</sup>, Klaus Kaiser<sup>1</sup>, Christian Mikutta<sup>2</sup>, and Robert Mikutta<sup>1</sup>

<sup>1</sup>Martin-Luther-Universität Halle-Wittenberg, Institut für Agrar- und Ernährungswissenschaften, Bodenkunde/Bodenschutz, Germany (jana.dobritzsch@landw.uni-halle.de)

<sup>2</sup>Gottfried Wilhelm Leibniz Universität Hannover, Institut für Mineralogie, Bodenmineralogie, Germany

Silicon (Si) is not considered an essential element for plant growth but improves blade stability and enhances the plant's ability to resist metal toxicities. In soil solution, dissolved Si can be present as monomeric and polymeric silicic acid. Pre-experiments showed that monomeric Si is much less competitive than dissolved organic carbon (DOC) in sorption to Fe oxides, suggesting that monomeric Si can easily be leached from upper soil layers. However, drying of soil can increase Si pore water concentrations, thus facilitating the formation of Si polymers. We tested the sorption of monomeric versus polymeric silicic acid to goethite ( $\alpha$ -FeOOH) at pH 4.5, and presumed stronger binding and less desorption by DOC for polymeric Si because of its multidentate mineral surface attachment. Equilibrium solutions were analysed for dissolved Si by optical emission spectrometry and Si species present at the mineral surfaces were revealed by X-ray photoelectron spectroscopy. Adsorption experiments indicated that the initial binding of polymeric Si was followed by surface polymerization at higher Si loads. Due to surface polymerization, the sorption of polymeric Si greatly exceeded that of monomeric Si. Besides adsorption experiments, desorption experiments using a DOC solution produced from an organic soil surface layer will provide information on the remobilization potential of the sorbed Si species. We hypothesize that (1) the displacement of monomeric as well as of polymeric Si by organic compounds depends on its surface loading and (2) polymeric Si is less desorbable than monomeric Si. Knowledge on the resistance of monomeric and polymeric Si against desorption by DOC will improve our understanding of processes controlling Si leaching and phytoavailability in soil.