

Role of Natural Organic Matter in Silicon speciation in soils

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The status of silicon (Si) in soils and its bioavailability for plants is an increasing concern. Silicon fertilization by natural silicates has the potential to mitigate environmental stresses and soil nutrient depletion. As a consequence, Si could be an alternative to the extensive use of phytosanitary and NPK fertilizers for maintaining sustainable agriculture [1]. Indeed, recent studies have shown the benefits of Si in the field of agriculture.

We have attempted to use molecular fluorescence spectroscopy to identify potential NOM-Si complex in aqueous solution. The first results have shown that there would be no direct coordinated bonds between NOM and Si, but perhaps a bridging connection through Al ions. The complexing capacities (C_L) and 1:1 stability constants (K) of fluorescing ligands with Al and Si were determined with the method of Ryan and Weber [2]. Moreover, in order to study the solid phase, we used Raman and FTIR spectroscopy for identifying the potential NOM-Si-Al complexes in the solid samples.

[1] Benefits of plant silicon for crops: a review, Guntzer, F., Keller, C., & Meunier, J. D. (2012). *Agronomy for Sustainable Development*, 32(1), 201-213.

[2] Fluorescence quenching titration for determination of complexing capacities and stability constants of fulvic acid, Ryan, D. K., & Weber, J. H. (1982). *Analytical Chemistry*, 54(6), 986-990.