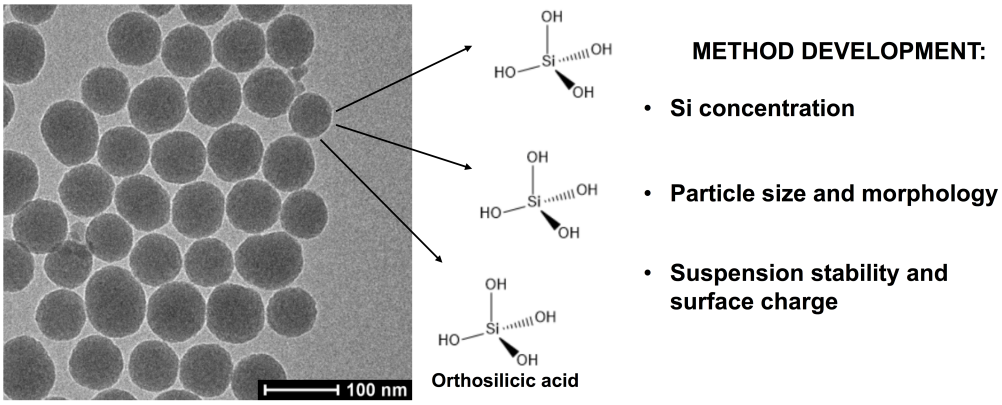
Multidisciplinary Method Development to Characterize and Quantify SiO_2 Nanoparticle Degradation in Complex Matrices

M. Maceroni[1,2], D. Bossert[1,2], L. Rodriguez-Lorenzo[1,2], D. A. Urban[1,2], A. Petri-Fink[1,2], B. Rothen-Rutishauser[1,2], F. Schwab[1,2]*

[1]Adolphe Merkle Institute, [2]University of Fribourg

Silica nanoparticles (SiO_2-NPs) and in general siliceous nanomaterials are used in a broad range of commercial products including foodstuffs and cosmetics. Recent research explores the use of SiO_2-NPs as a delivery vehicle for molecules in plants[1], which could be interesting for nano-agrochemicals, under the reservation that such SiO_2 nanomaterials degrade easily[2]. Fundamental knowledge for the development of such agricultural applications is needed to understand the SiO_2-NP behavior in the presence of plants and soil. Different parameters can influence the SiO_2-NP dissolution in aqueous solutions, or the degradation in biological/environmental media. Particle shape and size, degree of aggregation, porosity, pores size, morphology, and surface functionalization as well as mucilage and exudates of organisms can govern the dissolution/degradation rates [3]. We will present initial results of an experimental interdisciplinary approach to characterize and quantify the differential dissolution of SiO_2 NPs in media with increasing complexity, from simple aqueous solution to the highly complex soil matrix.



[1] H. I. Hussain, Z. Yi, J. E. Rookes, L. X. Kong, D. M. Cahill, *Journal of Nanoparticle Research* **2013**, *15*, 1676.
[2] F. Schwab, G. Zhai, M. Kern, A. Turner, J. L. Schnoor, M. R. Wiesner, *Nanotoxicology* **2016**, *10*, 257-278.
[3] J. G. Croissant, Y. Fatieiev, N. M. Khashab, *Advanced Materials* **2017**, *29*.