Multidisciplinary Method Development to Characterize and Quantify SiO$_2$ Nanoparticle Degradation in Complex Matrices

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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.