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# Exposure assessment of metal-based nanoparticles in aquatic environments: interactive influence of water chemistry and nanopaticle characteristics

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## Abstract

Transformation and bioavailability information of engineered nanoparticles (ENPs) in environmental systems impedes assessment of their potential risks to aquatic environments. In aqueous environments ENPs undergo numerous transformation processes; and presently their fate and behaviour are poorly defined. In this study the stability of naked Ag (40-60 nm) and ZnO (10-130 nm) ENPs using standard toxicity testing medium at strengths of 50HM and 100HM to mimic complex environmental water was investigated over 15 days. The ENPs size dynamics were tracked using TEM and NTA whilst ICP-MS quantified dissolution after ultrafiltration. Both Ag and ZnO ENPs underwent remarkable size growth and surface potential variations in the two testing medium strengths, resulting in significant nanoparticles concentration reduction in suspension. At higher ionic strength (100HM) the ENPs were more stabilized relative to the lower one (50HM), such an effect was confirmed by lower dissolution in 100HM. However, following the same test conditions with two sizes of citrate coated Ag ENPs (10 and 40 nm); dissolution between the two sizes varied and ENPs were more stable in 50HM, contradictory to results obtained from naked powder forms where dissolution in 100HM was highly inhibited. These results point to the complex dynamic nature of ENPs transformation in aqueous environments; that in turn determines the hazard potency of nano-pollutants. Our results point to implications for actual aquatic environments receiving nano-pollutants from usage of nano-enabled products at different life cycle phases.