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Toxicity of silver nanoparticles to green algae – towards a biotic ligand understanding

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Abstract:

In recent years the effects of silver nanoparticles (AgNP) has become one of the most studied areas of in nanoecotoxicology. Several studies have concluded that the toxicity of AgNP to freshwater organisms may be explained by the release of ionic silver. In this study, a series of experiments with the freshwater green algae *Pseudokirschneriella subcapitata* were carried out to falsify the hypothesis: “The toxicity of silver nanoparticles towards algae is solely caused by the monovalent silver ion”. These experiments were based on PHREEQC modeling of silver ion behavior (added as AgNO₃) in 72h OECD algal growth inhibition tests and a newly developed 4-h photosynthesis inhibition algal test. The tested AgNPs were of the same primary size (30 nm) but with different capping agents (citrate, mercaptoundecanoic acid, ...MARINA). Characterization included ICP-OES, DLS, NTA, and TEM before and after incubation. Results show that the toxicity of AgNO₃ and citrate-stabilized AgNP decreased significantly when the pH was lowered from 8.2 to 7.0. This is in contrast to PHREEQC predictions, but in agreement with the biotic ligand theory. The poster will focus a trends in changes in toxicity of AgNP as a result modifications of test conditions (pH, addition of mono-valent ions and chelator) benchmarked against changes predicted and observed for AgNO₃.