

Silver-mediated Fenton-like processes - do they occur in natural environments?

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The tendency for zero-valent silver to react violently with hydrogen peroxide has been recognised for some time with recent studies providing some insight into the reactions involved in this Ag-mediated catalytic H₂O₂ degradation process (He *et al.*, 2011, 2012). The reaction of H₂O₂ with redox active metals such as iron and copper is recognised to result in the production of powerful oxidants such as hydroxyl radicals and Fe(IV) (or Cu(III)) species and other oxidants might be produced by reaction with H₂O₂. We show that hydroxyl radicals are produced by reaction of silver nanoparticles (AgNP) with H₂O₂ and present a kinetic model which describes the reaction. The likely significance of AgNP-induced hydroxyl radical production to the recognised toxicity of AgNP is discussed.

He, D., Jones, A.M., Garg, S., Pham, A.N. and Waite, T.D. (2011). Silver nanoparticle - reactive oxygen species interactions: Application of an electron charging-discharging model. *Journal of Physical Chemistry C* 115(13), 5461–5468.

He, D., Garg, S. and Waite, T.D. (2012). H₂O₂-mediated oxidation of zero-valent silver and resultant interactions between silver nanoparticles, silver ions and reactive oxygen species. *Langmuir* 28, 10266–10275.