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Interactions between amino-phosphonates pesticides and titanium dioxide nanoparticle in water: consequences on their mobility

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Water quality is increasingly monitored worldwide, where various levels of nitrate and pesticide and/or metabolite contamination have been confirmed. Glyphosate [N-(phosphonomethyl)glycine] is probably the most widely used herbicide in the world. AMPA [aminomethylphosphonic acid] is its main degradation product. Although glyphosate mobility in the environment is supposed to be limited because of its high adsorption capacity in soils several studies show that glyphosate may reach both surface and ground-waters either by transport in dissolved form, or particle bonded onto soil colloids.
At the same time, in recent years, rapid development of new technologies has resulted in a significant increase in the production and uses of products containing nanoparticles, notably dioxide titanium nanoparticles. This enthusiasm for nanotechnology is however accompanied by awareness about the potential release and impact of the nanoparticles in the environment.

The aim of the study is to increase the knowledge on pesticide and nanoparticles interactions that may be present as contaminant cocktail in waters. Thanks to lab-experiments conducted with glyphosate or AMPA and rutile or anatase under different water chemistry conditions (pH, ionic strength, presence and concentrations of mono- and bivalent cations), we were able to describe the colloidal stability of nanoparticles that control their mobility and to characterize the sorption of pesticide on these nanoparticles and their transformation.