Sorption of Pesticides to Natural and Synthetic Nanoparticles

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Chemical and physical interactions between pesticides and solid surfaces of nanoparticles in aqueous environments may not only alter their reactivity and bioavailability. They also may affect mode of action of organic pollutants and, thus, the overall effects of these compounds on organisms and ecosystems. The main objective of the present work is to provide mechanistic information on the sorbate-sorbent interactions between nanoparticles and a set of pesticides under environmentally relevant and physiological conditions and to elucidate how such interactions impact the toxicological effects at various receptors.

To this end, natural and synthetic nanoparticles covering a wide range of properties and pesticides representing different modes of toxicity were used. Sorption experiments were carried out with insecticides (Imidacloprid; Thiacloprid), fungicides (Hexaconazole; Propiconazole) and herbicides (Glyphosate; AMPA; Glufosinate).

The impact of various geochemical and physiological conditions including pH, temperature, ionic strength, background electrolytes and DOM on the sorption of the pesticides to nanoparticles was studied. HPLC, LC-MS and Capillary Electrophoresis methods were implemented for samples analysis. Sorption kinetics and sorption isotherms were determined.

Fourier Transform Infrared Spectroscopy [FT-IR] was used for detailed sorption mechanism interpretation.