Ecotoxicological effect of altered TiO_2 nanocomposite on the earthworm, *Eisenia fetida*

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The quantity of nanomaterials produced annually is in constant increase. This trend may induce a strong increase of the release of nano by products in air, water, soils, and therefore in contact with organisms.

The aim of the present study was to evaluate the potential toxicity of altered TiO_2 nanocomposite initially contained in a manufactured sunscreen cream on the earthworm *Eisenia fetida*, taking account survival, cytotoxicity and immunotoxicity parameters.

In soils ecosystem studies, earthworms are used as suitable biomonitors because of their low cost, easy handling and standardization of ecotoxicological tests. In order to simulate the alteration of the nanocomposite, an accelerated aging process was realized by mixing TiO_2 nanocomposite with water during 48h. Then, a stable solution of TiO_2 rich nanoresidus was obtained, and chemically and physically characterized. Earthworms have been exposed to altered nanocomposite solutions at 4 concentrations (0, 0.1, 1 and 10 $mg.L^{-1}$) during 24h in the dark. The viability of cœlomocytes has been measured by the MTT assay and phagocytosis has been evaluated by microscopic observations of phagocytosed fluorescent latex beads.

Results showed that the altered TiO_2 nanocomposite had no effect on survival rate and did not induce cytotoxicity on cœlomocytes. By contrast, a significant decrease of phagocytosis activity was observed at 1 $mg.L^{-1}$. In conclusion, this short-time exposure may induce sublethal effects on earthworms at low concentrations.

Adsorption of Pb(II) at calcite-water interphase, revisited

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Introduction

An important anthropogenic pollutant Pb(II), now monitored in natural waters and sediments, has been intensively studied under controlled laboratory- and estuarine-conditions [1 – 8]. The aim of the work is to discuss on example of Pb(II) in carbonate solutions, what we have learned in 35 years, changing experimental and calculation techniques.

Results, Discussion and Conclusions

Complex formation between Pb(II) and hydroxide or carbonate ions started with electroanalytical methods [1 – 6]. Later, radiotracer [7] and EXAFS analyses [8] were performed. The last method provided direct spectroscopic evidence for formation of Pb(II) inner-sphere complexes with calcite, what could not be evidenced using electroanalytical methods. Conclusions in reference [8], obtained by advanced PHREEQC computer calculations, utilizing the MINTEQ database, do not give any new finding since the quoted early works of the two giants of mineral surface chemistry, Stumm and Schindler. Complex $PbCO_3^0$ (aq) via which dissolved Pb is transported to calcite surface, and the combination of mononuclear adsorption complex combined with precipitation of hydrocerrusite and cerrusite in concentrations above their solubility limit could be obtained by simple calculation and using constants from earlier works [1–5]. It can be concluded that besides development of advanced analytical and calculation techniques, exact and time consuming determination of equilibrium constants in heterogeneous systems should be continued for other elements.

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