

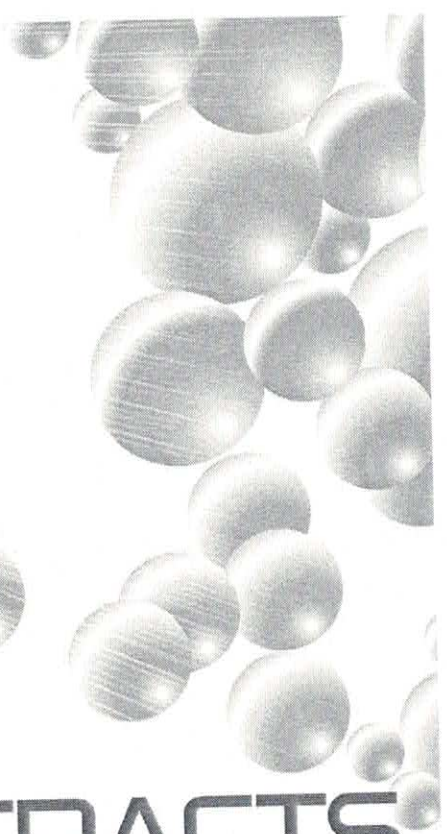
SIZE-DEPENDENT TOXICITY OF BARIUM TITANATE TO *CHLORELLA VULGARIS*

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Studies have been demonstrating that smaller particles can lead to unexpected and diverse ecotoxicological effects when compared to those caused by the bulk material. Among the materials that have been studied in the hopes of finding new applications when in small size, barium titanate (BT) has been gaining momentum for biological applications as nanocarrier for proteins, uptake enhancer of low molecular weight drugs such as doxorubicin, biomarker for imaging probes and in the design of bone graft material. However, studies on its impact on the environment are lacking. In this study, the chemical composition, size and shape, state of dispersion, and surface charge, area and physicochemistry of micro (BT MP) and nano barium titanate (BT NP) were determined. Green algae *Chlorella vulgaris* grown Bold's Basal (BB) medium or Seine River water (SRW) was used as biological indicator to assess their aquatic toxicology. Responses such as growth inhibition, cell viability, superoxide dismutase activity, adenosine-5-triphosphate content and photosynthetic activity were evaluated. Tetragonal BT (~170 nm, 3.24 m² g⁻¹ surface area) and cubic BT (~60nm, 16.60 m² g⁻¹) particles were negative, poorly dispersed, readily aggregated, and precipitated in both SWR and BB medium. As for the aquatic toxicology: (i) BT has a statistically significant effect on *C. vulgaris* growth even at the lower concentration tested (1ppm), what seems to be mediated by induced oxidative stress caused by the particles; (ii) the BT behavior was different when in synthetic or in natural culture media, the toxic effects in *C. vulgaris* being more pronounced when grown in SRW (in this case, a worse physiological state of the algae growing in SRW can occur and account for the lower resistance, probably linked to a paucity of nutrients or even to a synergistic effect with a contaminant from the river); and (iii) size does not seem to be an issue influencing the toxicity in BT particles toxicity since micro- and nano-particles produced significant effects on algae growth – although the growth inhibition was more pronounced with the nanomaterial.

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