Algal testing of titanium dioxide nanoparticles - Testing considerations, inhibitory effects and modification of cadmium bioavailability - DTU Orbit (20/10/2018)

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The ecotoxicity of three different sizes of titanium dioxide (TiO(2)) particles (primary particles sizes: 10, 30, and 300 nm) to the freshwater green alga Pseudokirchneriella subcapitata was investigated in this study. Algal growth inhibition was found for all three particle types, but the physiological mode of action is not yet clear. It was possible to establish a concentration/dose-response relationship for the three particle sizes. Reproducibility, however, was affected by concentration-dependent aggregation of the nanoparticles, subsequent sedimentation, and possible attachment to vessel surfaces. It is also believed that heteroaggregation, driven by algal exopolymeric exudates, is occurring and could influence the concentration-response relationship. The ecotoxicity of cadmium to algae was investigated both in the presence and absence of 2 mg/L TiO(2). The presence of TiO(2) in algal tests reduced the observed toxicity due to decreased bioavailability of cadmium resulting from sorption/complexation of Cd(2+) ions to the TiO(2) surface. However, for the 30 nm TiO(2) nanoparticles, the observed growth inhibition was greater than what could be explained by the concentration of dissolved Cd(II) species, indicating a possible carrier effect, or combined toxic effect of TiO(2) nanoparticles and cadmium. These results emphasize the importance of systematic studies of nanoecotoxicological effects of different sizes of nanoparticles and underline the fact that, in addition to particle toxicity, potential interactions with existing environmental contaminants are also of crucial importance in assessing the potential environmental risks of nanoparticles. (C) 2009 Elsevier Ireland Ltd. All rights reserved.

General information
State: Published
Organisations: Environmental Chemistry, Department of Environmental Engineering
Contributors: Hartmann, N. I. B., von der Kammer, F., Hofmann, T., Baalousha, M., Ottofuelling, S., Baun, A.
Pages: 190-197
Publication date: 10 Mar 2010
Peer-reviewed: Yes

Publication information
Journal: Toxicology
Volume: 269
ISSN (Print): 0300-483X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.39 SJR 1.1 SNIP 0.978
Web of Science (2017): Impact factor 3.265
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.91 SJR 1.468 SNIP 1.198
Web of Science (2016): Impact factor 3.582
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.7 SJR 1.345 SNIP 1.262
Web of Science (2015): Impact factor 3.817
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.39 SJR 1.23 SNIP 1.256
Web of Science (2014): Impact factor 3.621
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.9 SJR 1.239 SNIP 1.443
Web of Science (2013): Impact factor 3.745
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.79 SJR 1.303 SNIP 1.361
Web of Science (2012): Impact factor 4.017
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1