

Beyond single nanomaterial exposure: Investigating the fate of a TiO₂ and CeO₂ nanomaterial mixture in freshwater mesocosms

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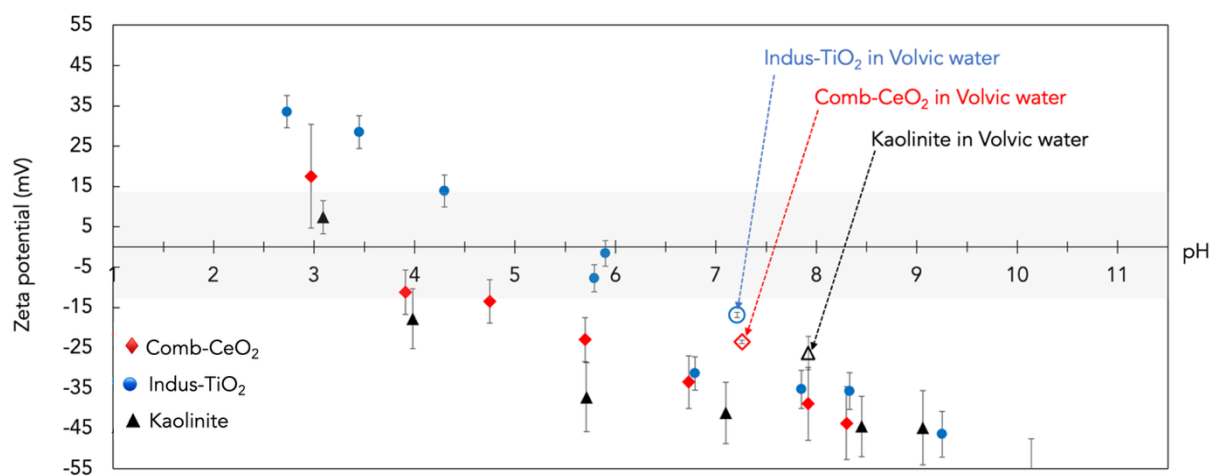


Figure S 1. Measurements of the isoelectric points of comb-CeO₂, indus-TiO₂ and kaolinite (ultrapure water, 25° C, [ENMs]=10 mg.L⁻¹, [kaolinite]=10 mg.L⁻¹). Electrophoretic mobilities were measured using laser doppler electrophoresis (ZetaSizer Nano ZS, Malvern Instruments). The pH values were adjusted between 2 and 11 using HCl or NaOH. Results are the means of 3 measurements, with 10-100 runs for each.

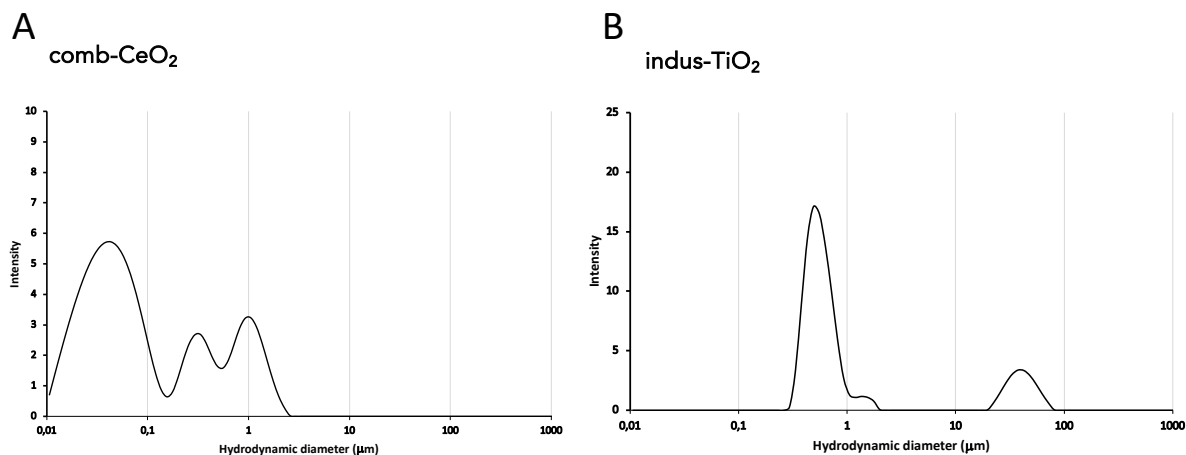


Figure S 2. Size distribution of A) comb-CeO₂ and indus-TiO₂ ENMs in ultrapure water. Hydrodynamic diameters were measured using laser diffraction (Mastersizer 3000, Malvern Instruments). [ENMs]=50 mg.L⁻¹.

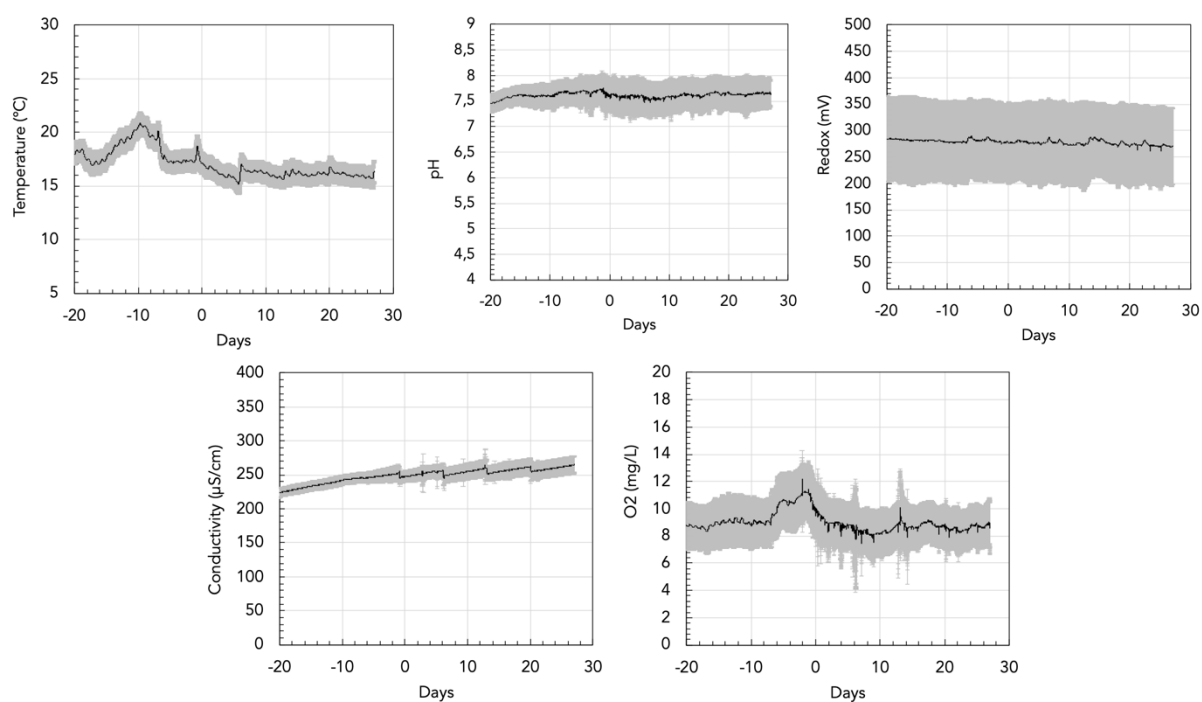


Figure S 3. Evolution of the physical-chemical parameters in the water column of the freshwater mesocosms. Redox potential, temperature, dissolved oxygen, pH, and conductivity were measured during the stabilization and contamination phases. Day 0 corresponds to the first dosing of ENMs. The grey surface is defined by the standard deviation and the dark line corresponds to the average values of the 4 mesocosms. One measurement was performed every 5 min.

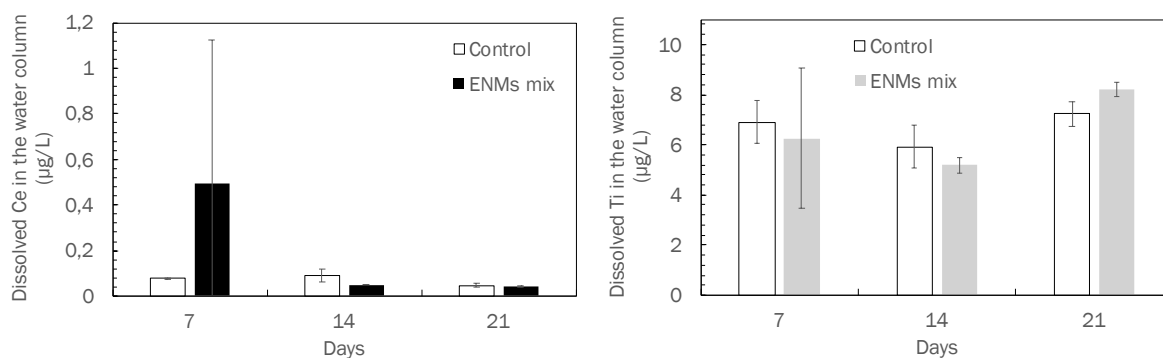


Figure S 4. Dissolved Ce and Ti concentrations (< 3 kDa) measured in the water column at 7, 14, 21 and 28 days in controls and mesocosms contaminated with a mix of comb-CeO₂ and indus-TiO₂ ENMs (ENMs mix). Data represent average $\pm$ standard deviation of replicates. The statistical significance was determined by the Student's t-test with * corresponding to $p < 0.05$.

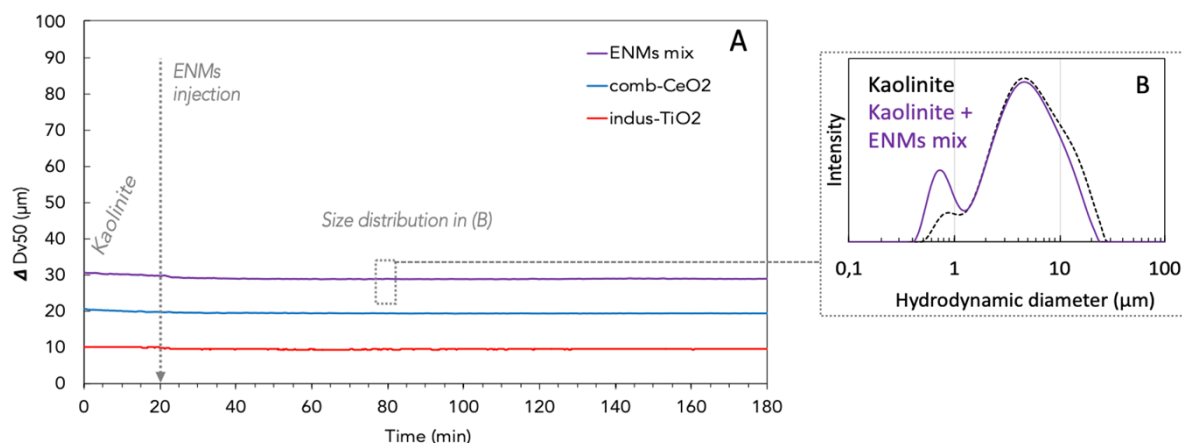


Figure S 5. Heteroaggregation of comb-CeO₂ and/or indus-TiO₂ ENMs with kaolinite during batch experiments. (A) Data are expressed in ΔDv_{50} i.e. the volume-weighted median particle size at a given time subtracted from the volume-weighted median particle size of the kaolinite 20 minutes before ENMs dosing. The dotted arrow indicates the injection 1 mg.L⁻¹ of comb-CeO₂ and/or 1 mg.L⁻¹ of indus-TiO₂ ENMs into the kaolinite suspensions (10 mg.L⁻¹) in Volvic® water (pH=7.2, IS=2.65 mM). (B) Distribution of the hydrodynamic diameters after one hour of interaction with the ENMs mix. The dotted curve in B corresponds to the distribution of the hydrodynamic diameters of the kaolinite particles only.

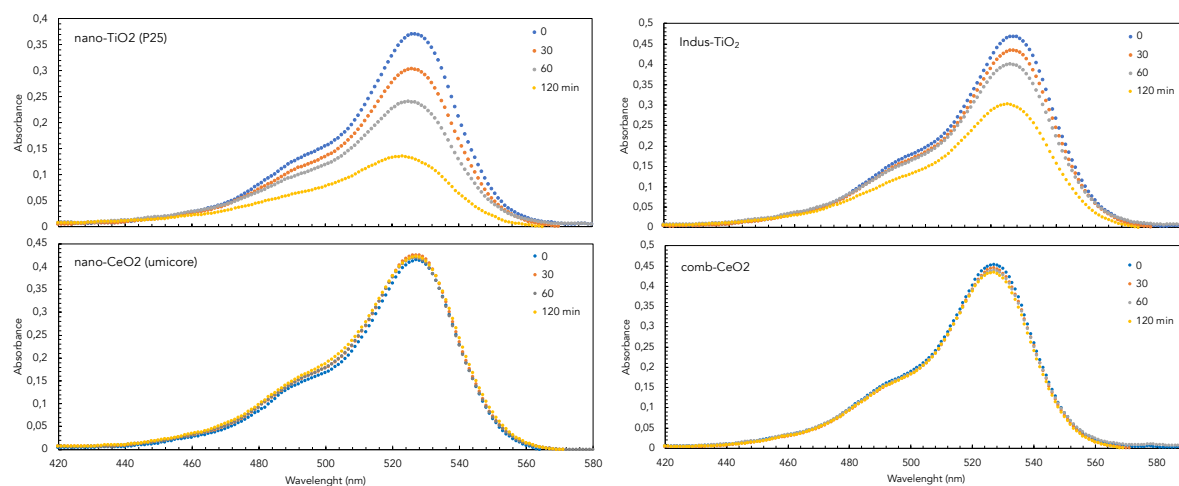
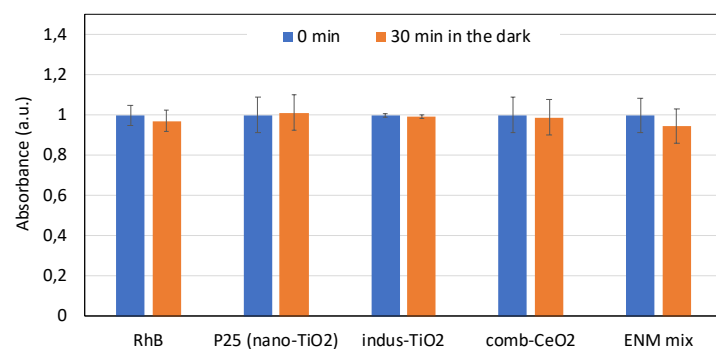


Figure S 6. (histogram) RhB relative adsorption after 30 min equilibrium in the dark. (graphs) UV-Vis spectra change during the photodegradation of the RhB molecule in the presence of the different ENMs.