

An integrated approach to assess the environmental risks of nanomaterials

Melanie Auffan^{1,2,3*}, Lenka Brousset^{2,5}, Alain Thiéry^{2,5}, Mark R. Wiesner^{2,3}, Jerome Rose^{1,2,3}, Jean-Yves Bottero^{1,2,3}

1 CNRS, Aix-Marseille Université, CEREGE UM34, UMR 7330, Aix en Provence, France.

2 GDRi iCEINT, Aix en Provence, France.

3 CEINT, Duke University, Durham, North Carolina, USA.

4CNRS, Aix-Marseille Université, CEA Cadarache DSV / IBEB / SBVME, LEMiRE, UMR 7265, Saint Paul lez Durance, France.

5 CNRS, Aix-Marseille Université, CNRS, IMBE, UMR 7263, Marseille

To date, headway has been made in exploring the potential impacts of engineered nanomaterials (ENMs) on human health. However, investigation of the roles of nano-scale objects towards evolutionary change, environmental disturbance, ecosystem structure and function have lagged behind the advances in fabricating, measuring and manipulating materials at the nano-scale. Moreover, current approaches to assess the ENMs environmental safety are based on classical ecotoxicology approaches, which are not always adequate for ENMs. For instance, most of the research only concerns the hazard but rarely the exposure to ENMs that plays a pivotal role to understand their environmental risks. The exposure depends on various properties; some of them are those of colloids (e.g. hetero-, homo-aggregation, adsorption of organic matter), while others are characteristic of nano-size (e.g. redox transformation, dissolution and ubiquitous mineralogy).

We will present an innovative design offering physico-chemists, (micro)biologists, and ecologists the possibility of conceiving robust experiments to study the exposure and impacts of engineered nanomaterials as well as mechanistic concepts at various time and spatial scales. This system is based on modular, intermediate size indoor aquatic mesocosms. It is adjustable to several ecosystems as lotic, lentic, estuarine, or lagoon environments. This experimental design has been approved at the European level as a Standard Operational Procedure (SOP) to characterize the environmental exposure and impact of ENMS (Auffan et al. 2014).

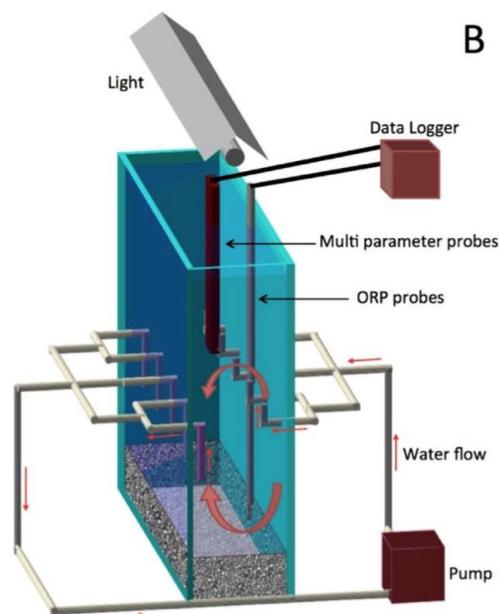


Figure 1. scheme of indoor aquatic mesocosms.

References

Auffan M et al. (2014) Scientific reports 4: 5608.

Corresponding author email: auffan@cerege.fr