Ecotoxicity CoR: bioaccumulation, ecotox testing, systems biology approaches

Break out session

Thursday March 12, Venice

Agenda

1. Revisit CoR scope
2. Co-chair rotation
3. Selected key research needs
4. Presentations
   - Jason White:
   - Claus Svendsen:
   - Phil Sayre:
5. Discussion:
   - can we provide guidance on what to report to ensure good quality of ecotoxicological dataand the possibility to re-assess results once we have a better understanding of environmental fate and concentrations (Risk assessment = f(exposure, hazard).

Ecotox CoR scope

- To engage the scientific communities in Europe and the US currently conducting environmental research on nanomaterials, to connect similar efforts, and
- To encourage the evolution of hazard assessment methods and predictive models built on
  - The foundations of fundamental research characterizing fate (including ageing) of nanomaterials in different environmental compartments and the interactions of nanomaterials with biota and ecosystems
  - Communication among regulators, experimentalists, modelers (e.g., to make data available / useful data format) to help modelers, experimentalists and risk assessors

Selected key research needs

- Exposure:
  - Routine analytical techniques applicable for ecotox relevant doses and test systems
  - Characterization methods for complex samples/environmental samples that are robust, reliable and relatively easy to implement in a standard laboratory
  - Confirming exposure incl. agreeing on procedure for measuring body burden (e.g., w/wo depuration)
  - Exposure duration: indication that nano-related effects may not be captured using short-term test – i.e., more long-term tests
  - Endpoints: indication for different sensitivity for some NMs.

Selected key research needs

- Dosing:
  - Environmentally relevant dosing in addition to conventional approaches: e.g., to overlying water and let particles settle naturally in stead of spiking sediment.
  - How to perform water/media exposures with NMs that settle
  - Linking external dose and internal dose:
  - Linking internal fate (bio-distribution) and toxicity: results suggest that internal mechanisms of uptake and internal fate differ between nano and non-nano metals. Need methods to analyze NMs in tissue.

Selected key research needs

- Toxicology:
  - NM characterization: environmental & tissue
  - Artifacts (handling, storage, experimental) may impact interpretation
  - Terrestrial
  - Bioaccumulation, kinetics
  - Trophic transfer
  - More?

What to report to 'secure' future use/revisit ecotoxicological data

- As the characterization techniques develops (incl fate models) it enables increasing our understanding of Fate and thus measurement and determination of Environmental concentrations in different compartments (water, sediment, soil, plants, tissue)
- Can we pinpoint key parameters that we should measure and report when conducting ecotoxicological studies to enable re-assessment of results when we know more about ENM fate and environmental exposure concentrations?
- Should be parameters that can be measured in a standard laboratory - i.e., not the scientific fate descriptors that require more sophisticated equipment BUT rather standard parameters that can easily be determined (pH, temp., salinity, CHN etc etc)

- ***Environmental drivers of ecotoxicology***

What to report to 'secure' future use/revisit ecotoxicological data

- Synthesis
  - Sonication using reliable procedures e.g., how much power is delivered ….
  - Storage condition (time, Light/Dark, temperature…)
- Characterization
  - Before experimental use (in DI, test media..)
  - During/End of exposure:
    - Water?
    - Sediment/soil: desirable but challenging
- Experimental
  - All: pH, temp., salinity, natural vs artificial
  - Test media:
    - Water (???) / Test media (??)
    - Sediment (OM, CHN, black carbon, sediment particle size)
    - Soil