

Panelist name:

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Title:

Biological Interactions in coastal marine ecosystems

Abstract:

Metal oxide and metal composite nanoparticles provide many transformative materials for science and technology, including healthcare, communications, transportation, and industrial chemistry. This rapidly expanding group of engineered nanomaterials (ENMs) is an emerging class of pollutants that may affect aquatic ecosystems through biological impacts on coastal marine organisms. I present results from experiments that explore potential impacts of ZnO, CuO, TiO₂, and nano-Ag on marine organisms from phytoplankton to benthic suspension feeders. In general, biological impacts differed substantially with the type of ENM and the rate at which they dissolved in seawater. In addition, ENM impacts did not differ significantly from those reported for the same micro-scale metal oxide materials. Experiments with TiO₂ indicated that this material can be highly toxic to phytoplankton and zooplankton under natural light levels. Dynamic Energy Budget modeling was used to generalize beyond experimental results, and to link subcellular injury with demographic effects, including population growth rates. Results imply that metal oxide ENMs can have significant biological impacts on marine organisms, but that the ecological risk of significant impacts is relatively low if environmental release and loading rates remain small, and we can develop environmentally safer products.

Biography highlights:

1. Application of ecological theory and principals to environmental problem solving in the marine environment
2. Marine ecotoxicology
3. Marine conservation and restoration
4. Socio-Ecological-Systems research, especially that related to fisheries management