Environmental Fate of Nanoparticles

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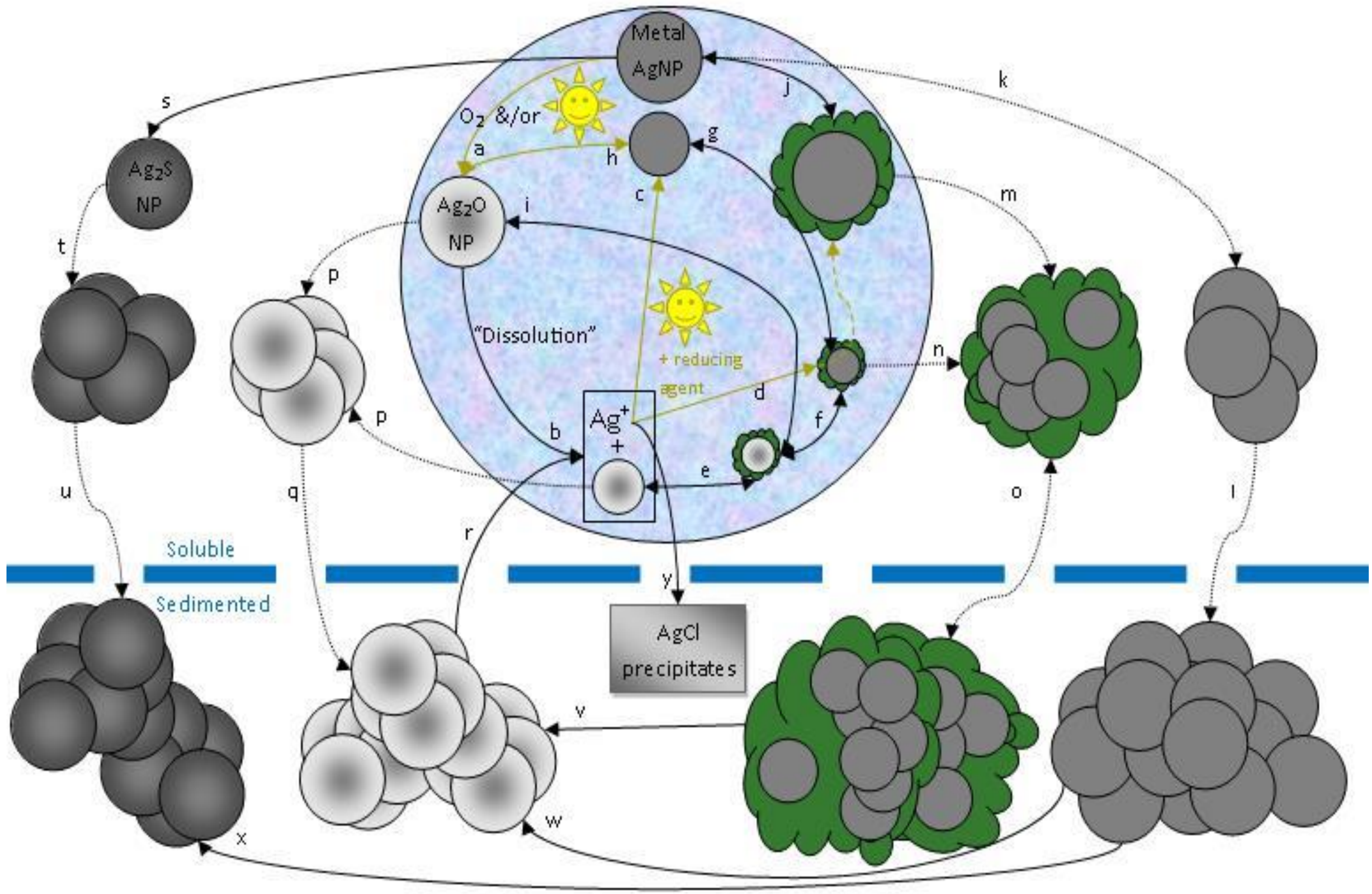
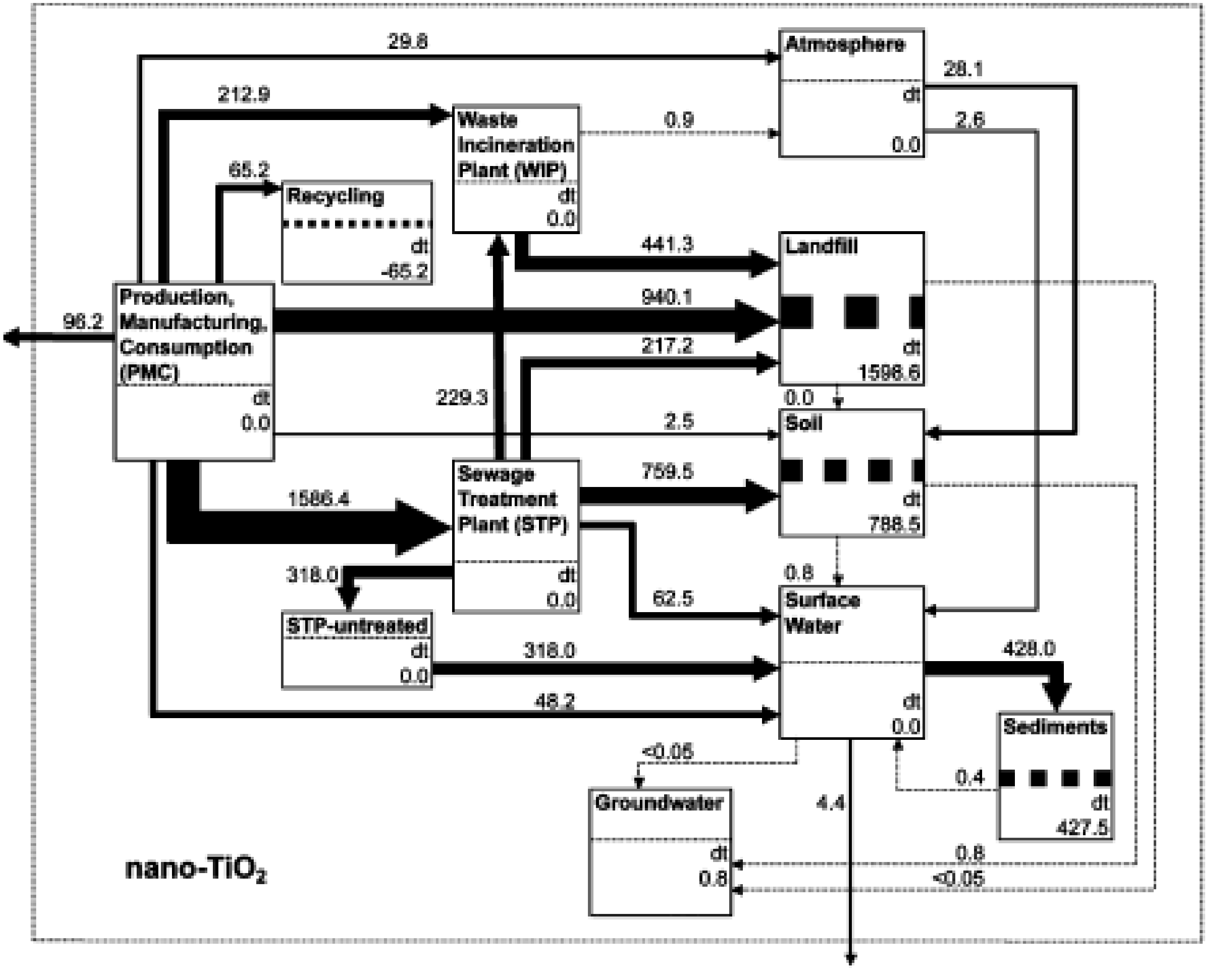


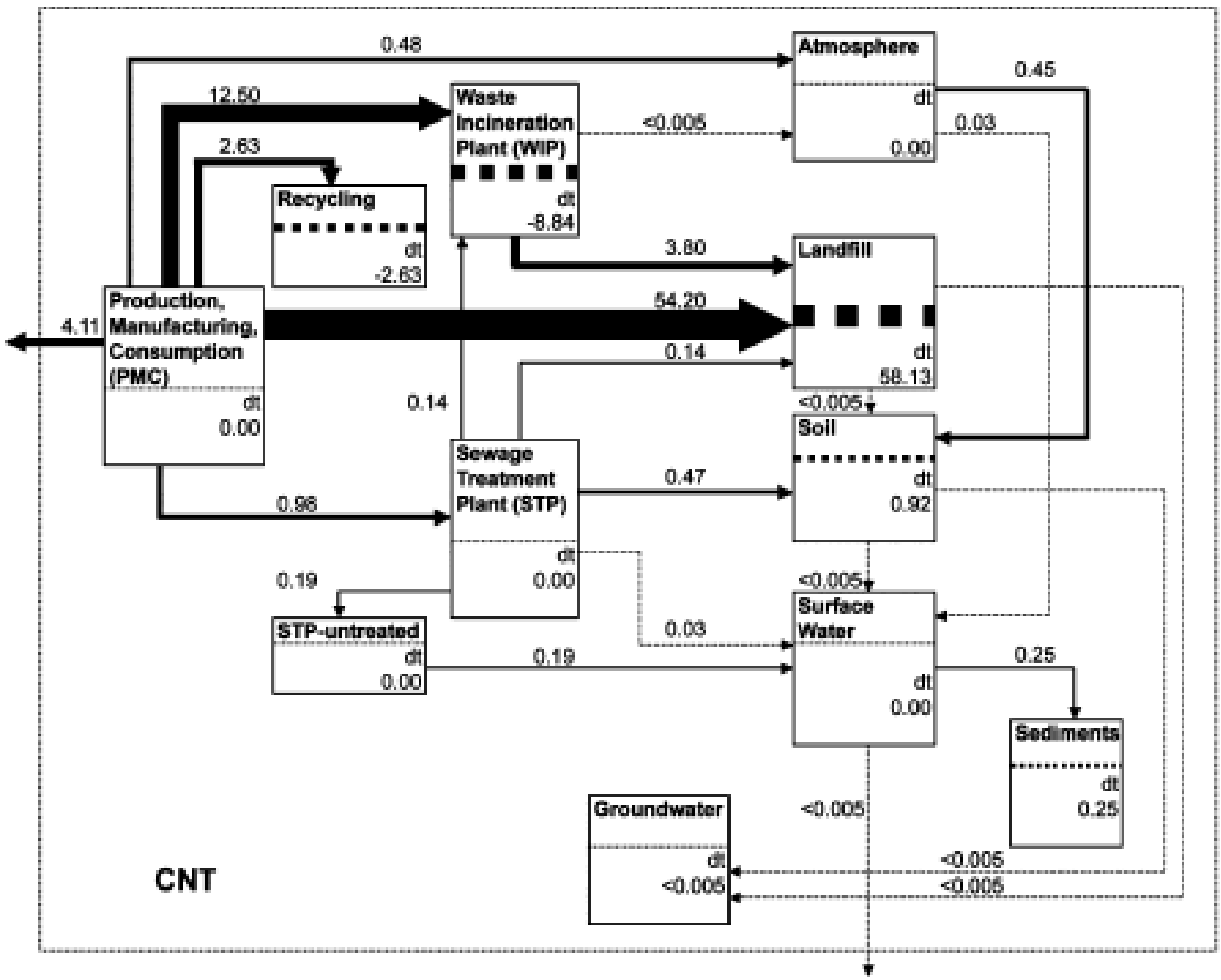
MacCuspie, R. I. Characterization of nanomaterials for environmental studies. In *Nanotechnology Environmental Health and Safety: Risks, Regulation and Management*, 2014.

Modeling of Environmental Fate



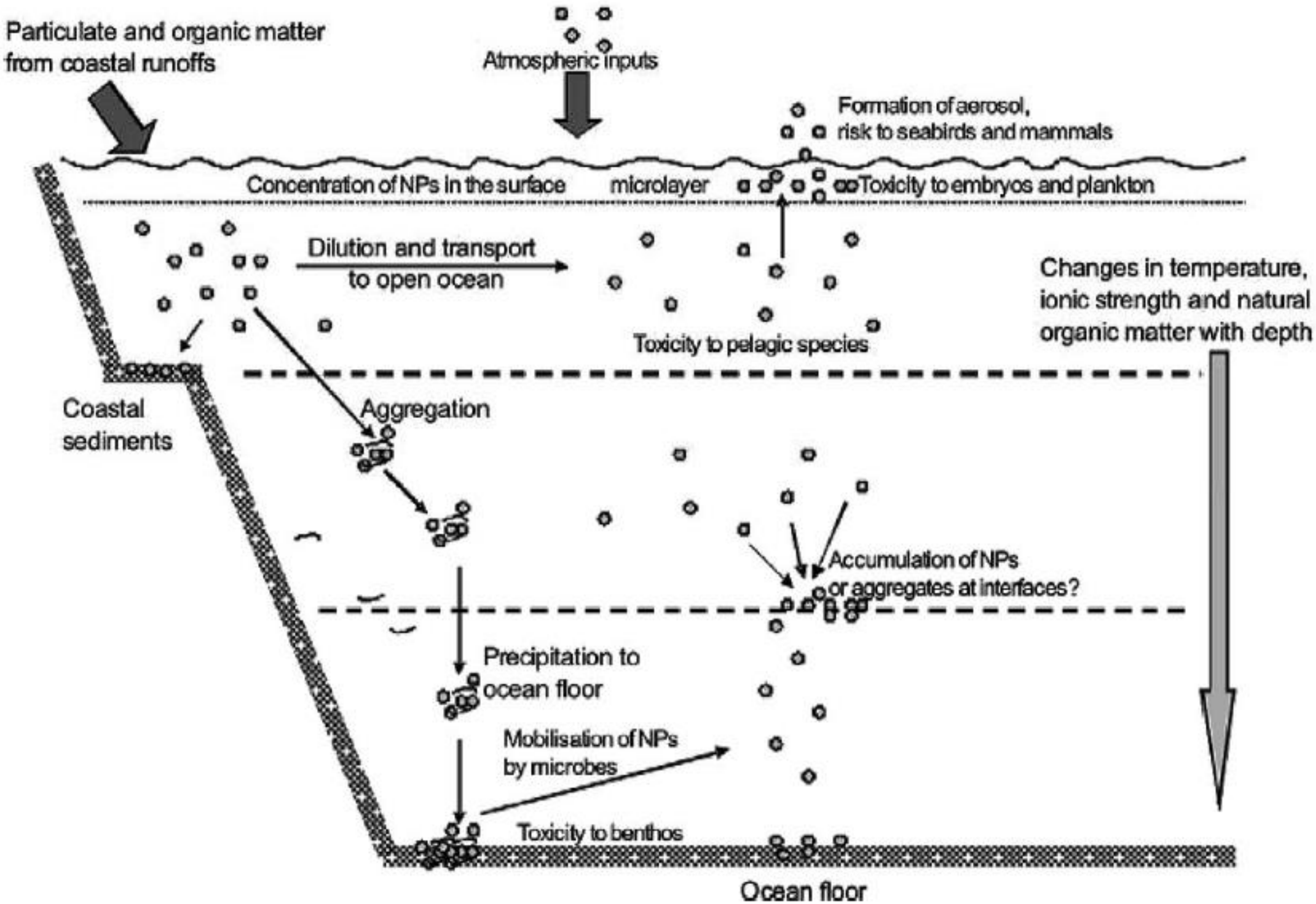
Gottschalk et al., Environmental Science and Technology, 2008, pages 9216-9222.

Modeling of Environmental Fate



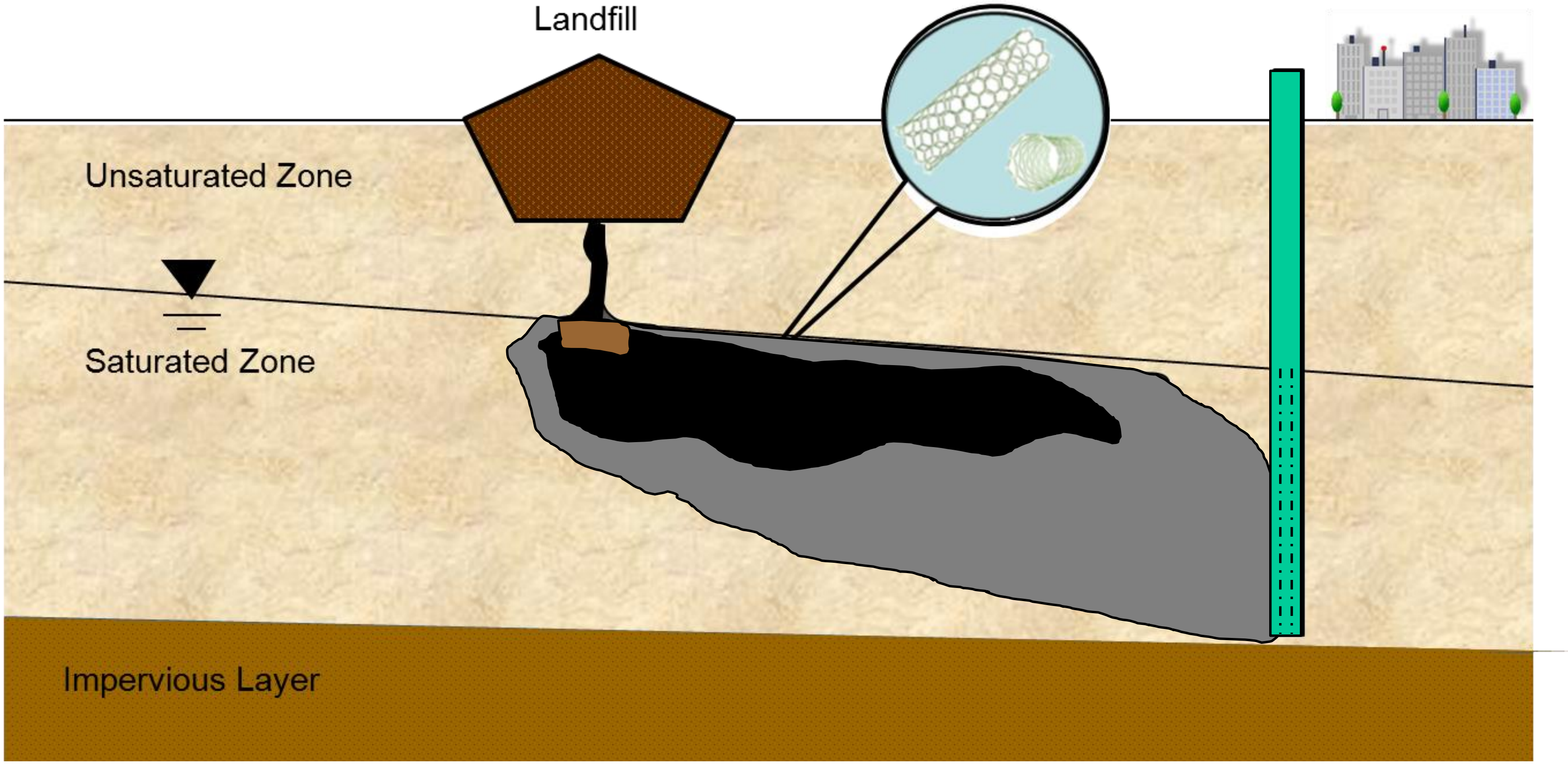
Gottschalk et al., Environmental Science and Technology, 2008, pages 9216-9222.

NP Changes in the Environment



Klaine et al., Environ Toxicol. Chem., 2008, pages 1825-1851.

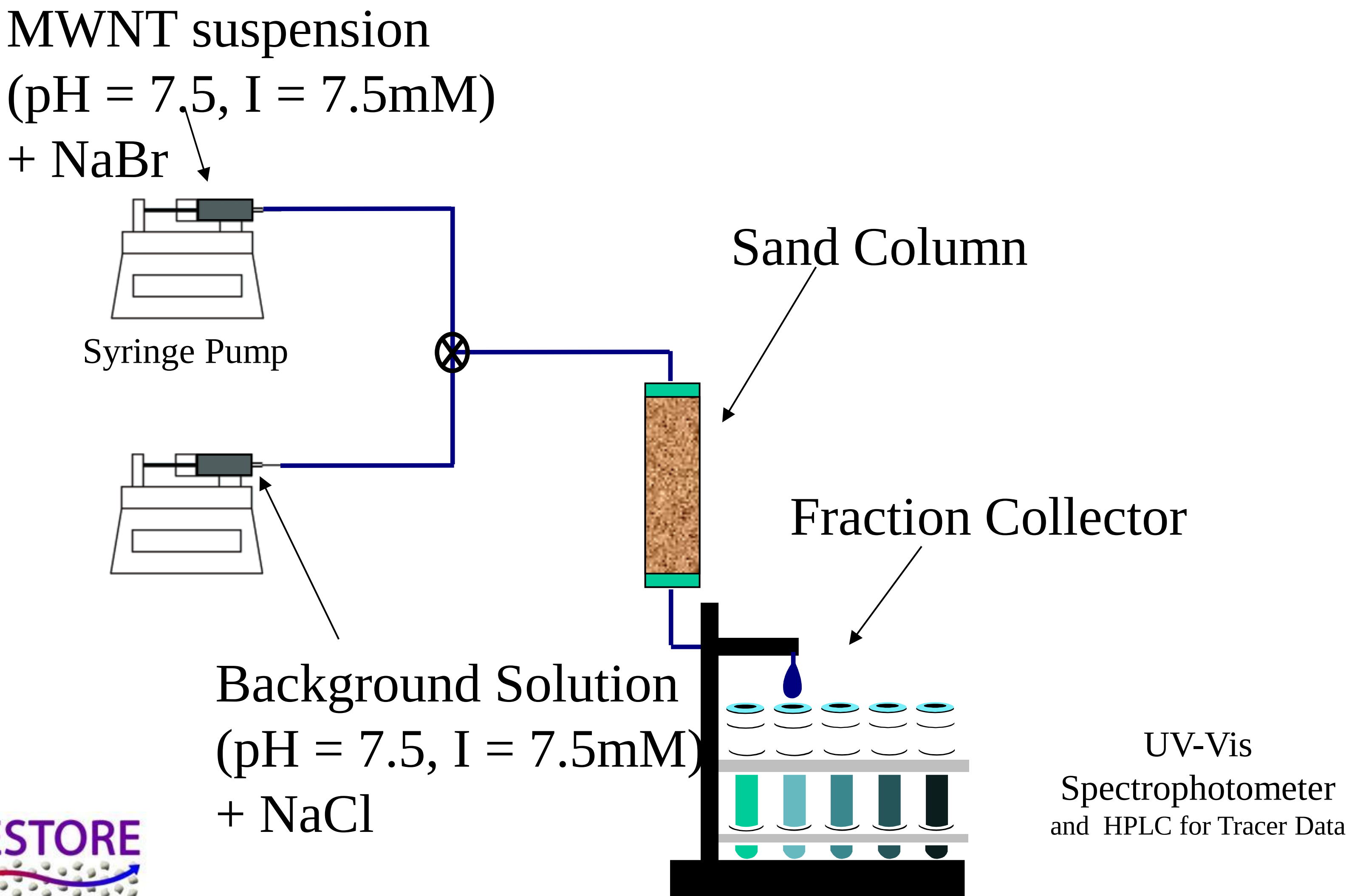
Contamination from a Landfill



RESTORE
Research for Subsurface
Transport and Remediation

Western

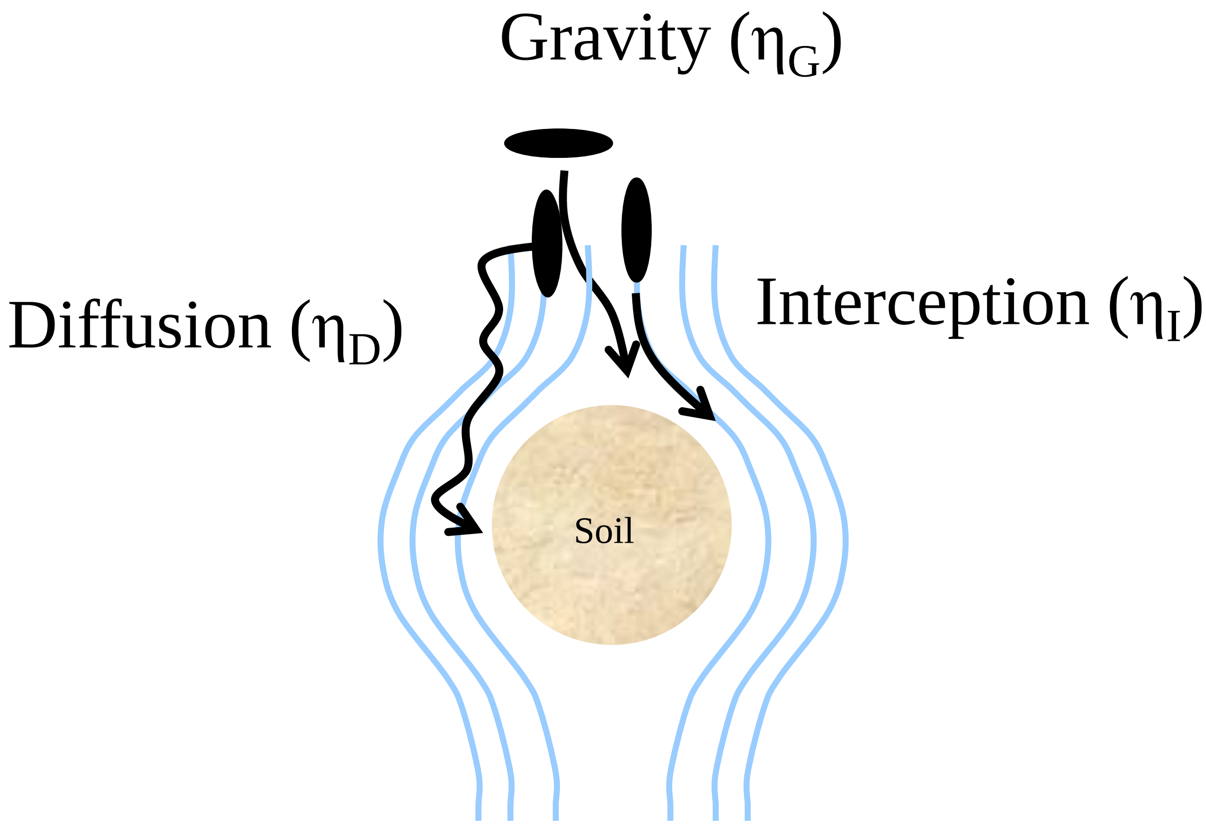
Experimental Setup



RESTORE
Research for Subsurface Transport and Remediation

Western

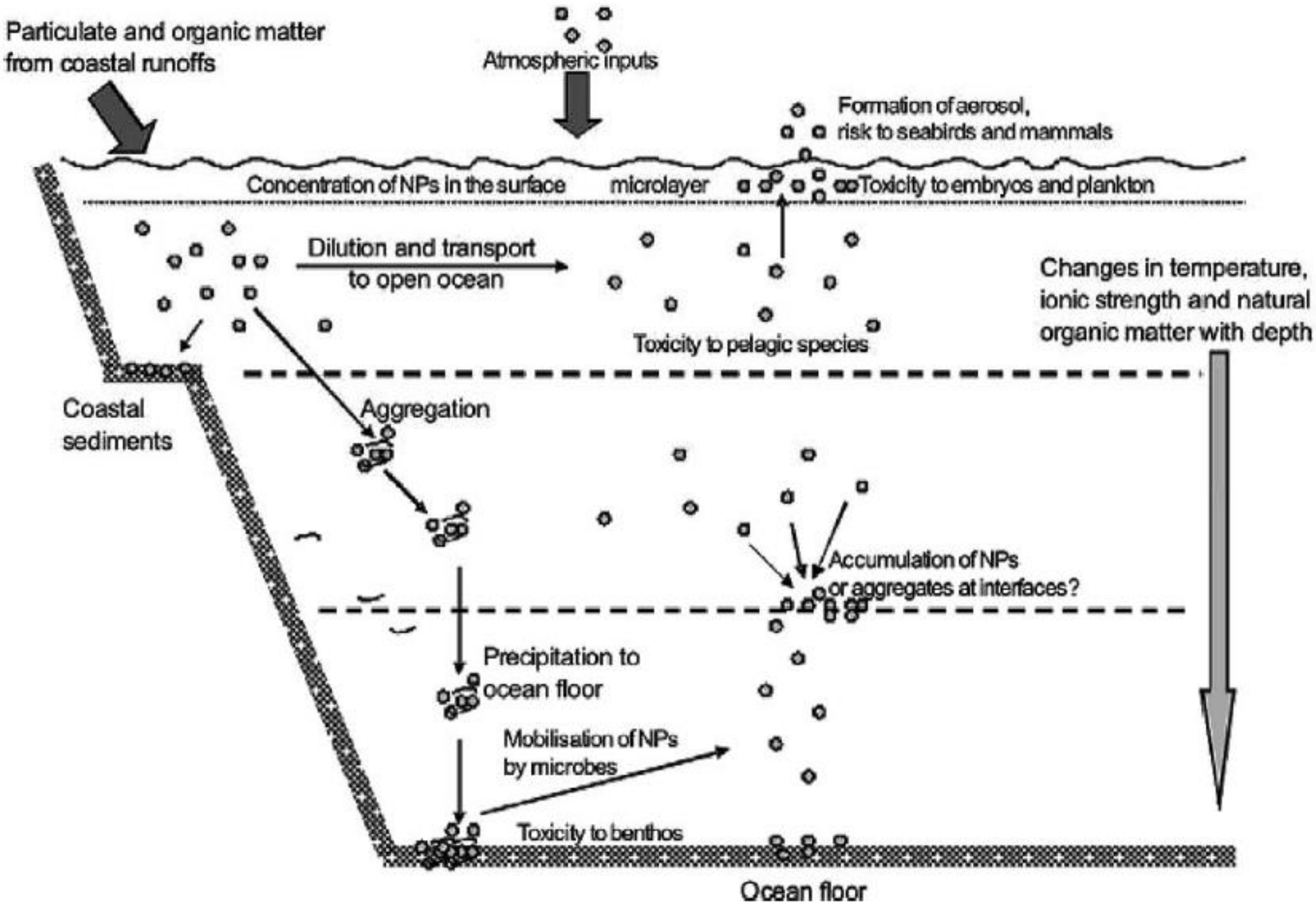
Traditional Removal Mechanisms
Multiphase flow



Single collector efficiency:

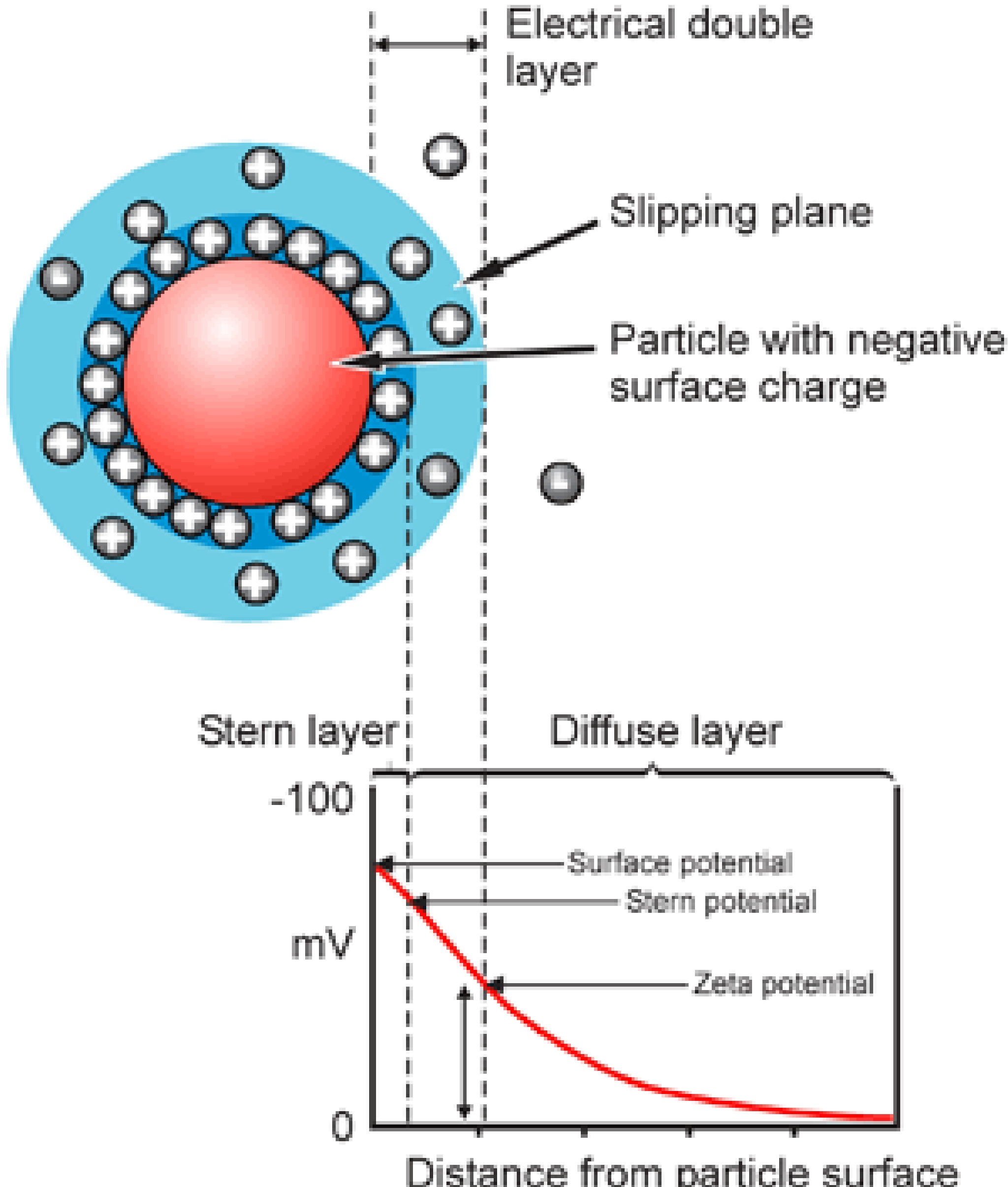
$$\eta_0 = \eta_G + \eta_D + \eta_I$$

NP Changes in the Environment



Klaine et al., Environ Toxicol. Chem., 2008, pages 1825-1851.

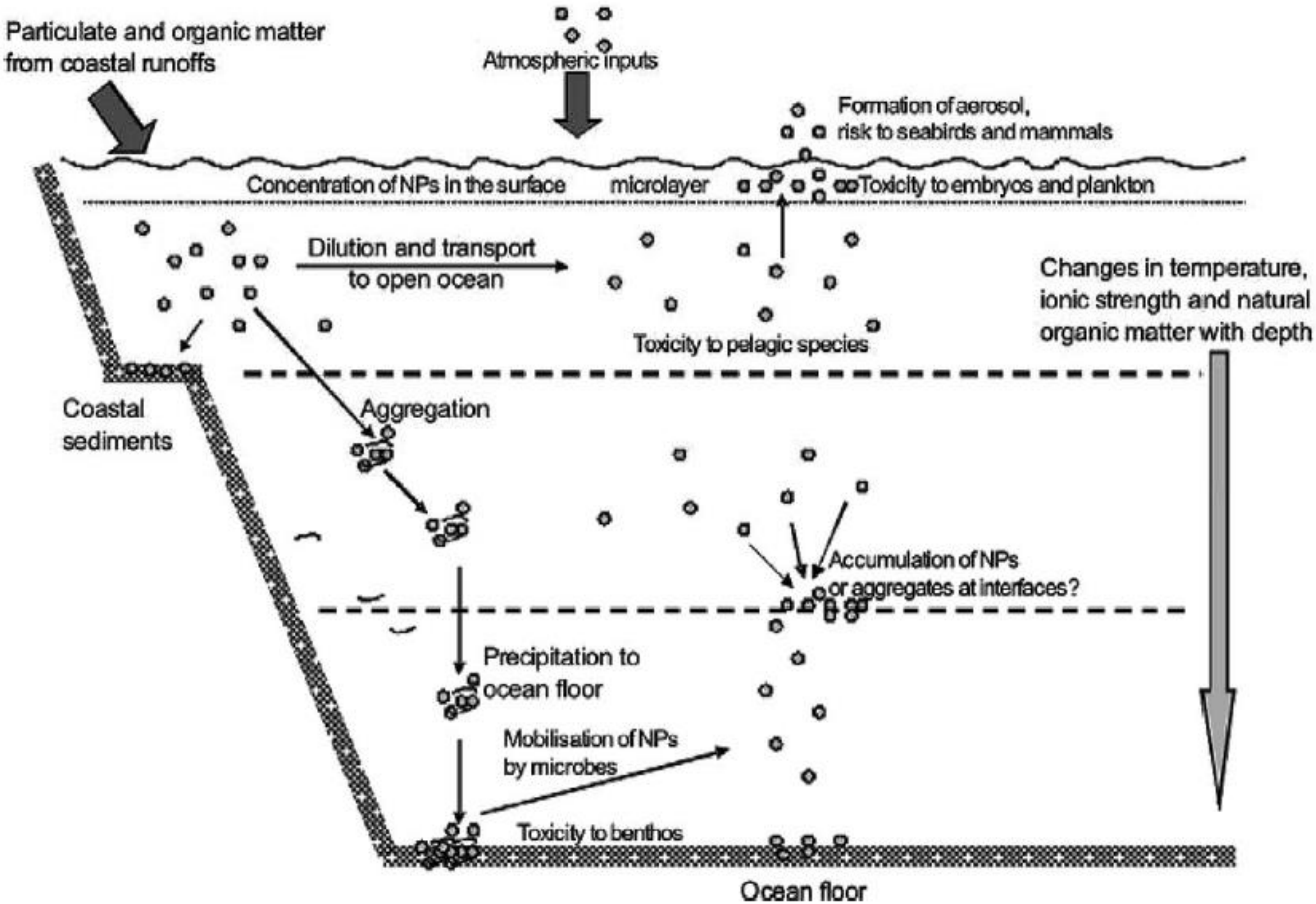
NP Agglomeration



Factors that Influence NP Agglomeration

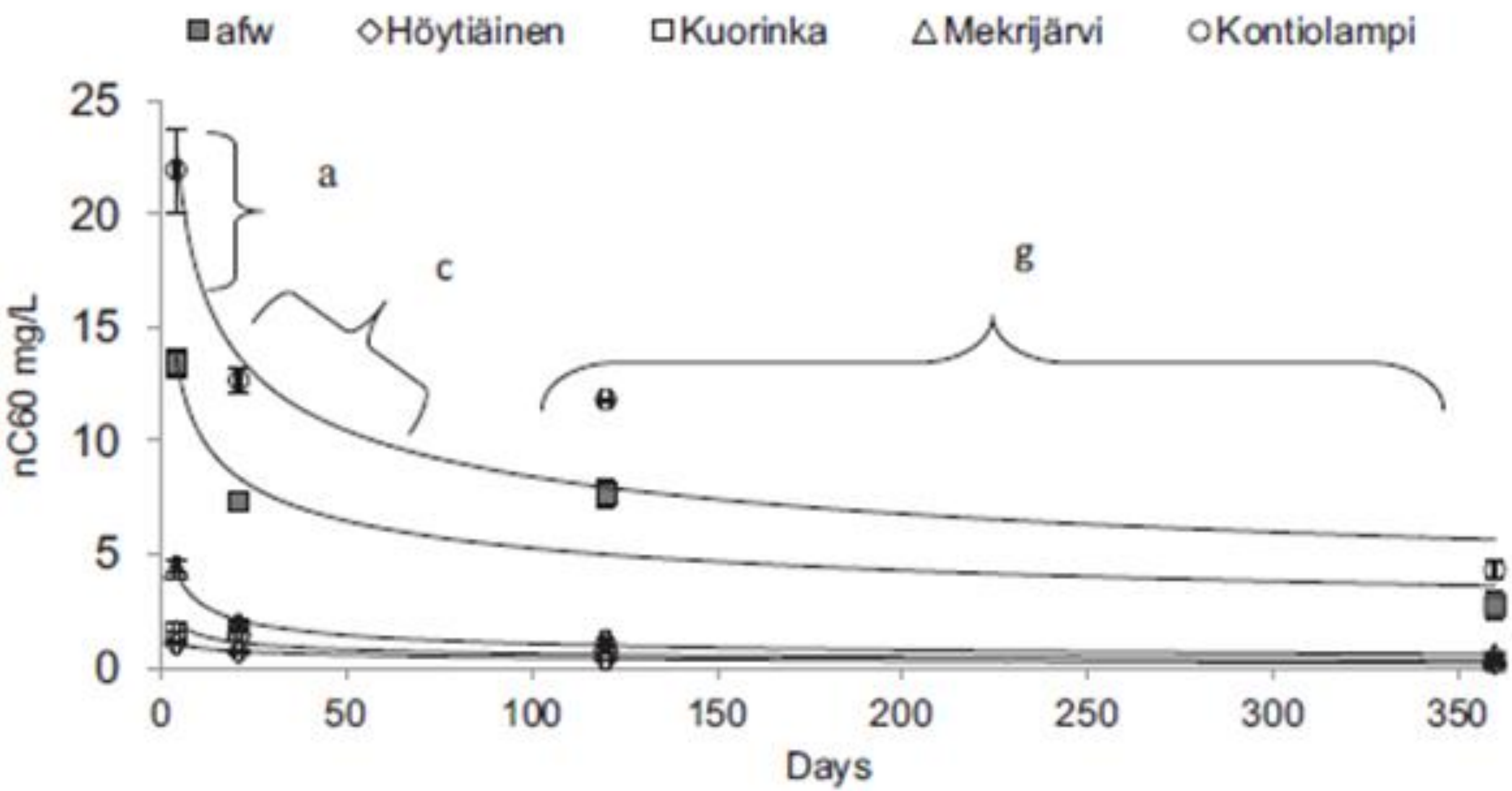
- **pH**
- **Ionic Strength**
- **Divalent or Monovalent Cations**
- **Natural Organic Matter**
- **Surface Coatings**
- **Particle Size**

NP Agglomeration



Klaine et al., Environ Toxicol. Chem., 2008, pages 1825-1851.

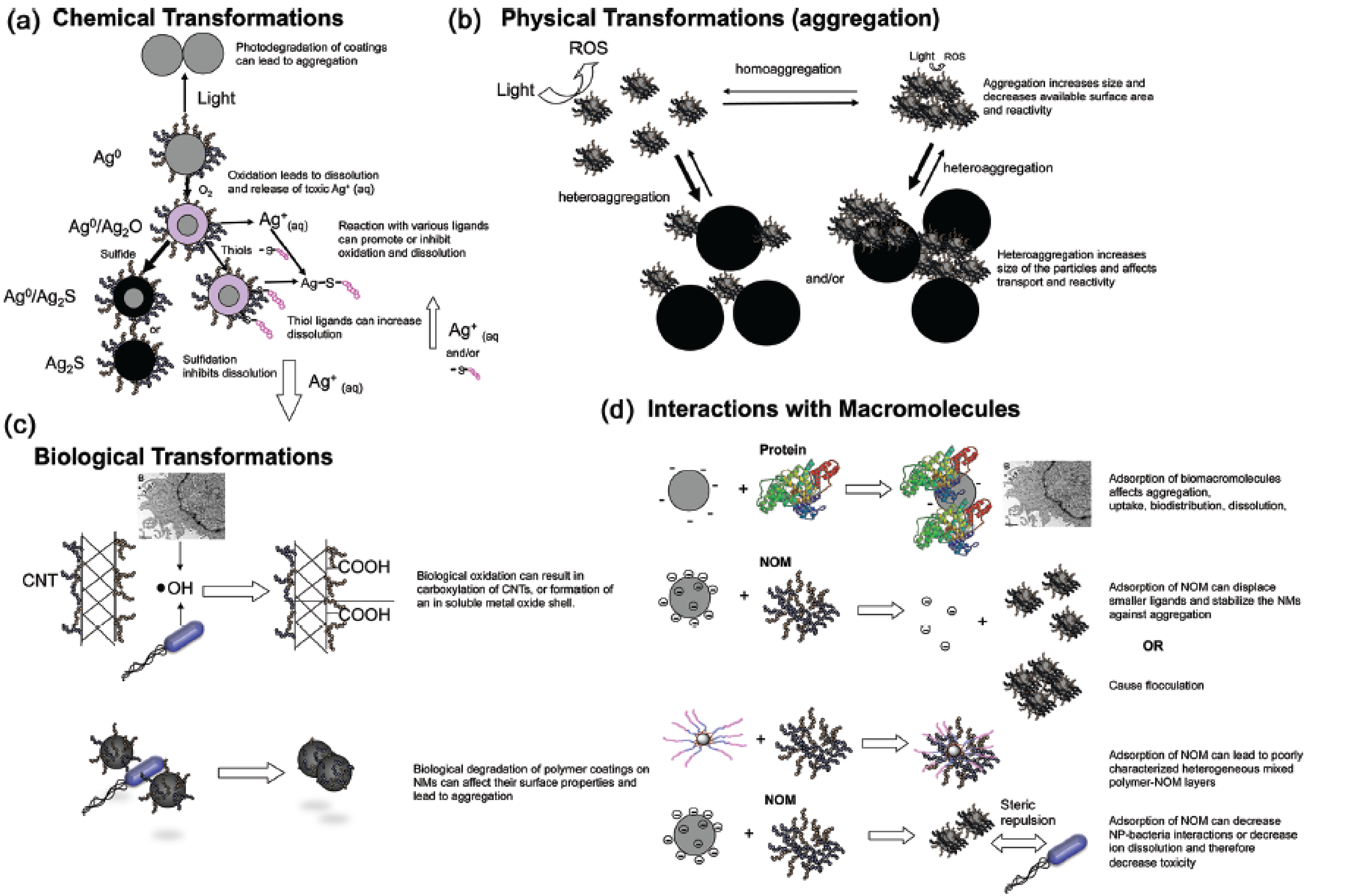
C60 Settling in Finnish Lake Waters



Water stability was affected by the quality and molecular size distribution of dissolved natural organic matter (DNOM). Increasing DNOM molecular sizes with high aromatic content enhanced water stability. Initial concentration was 100 mg/L

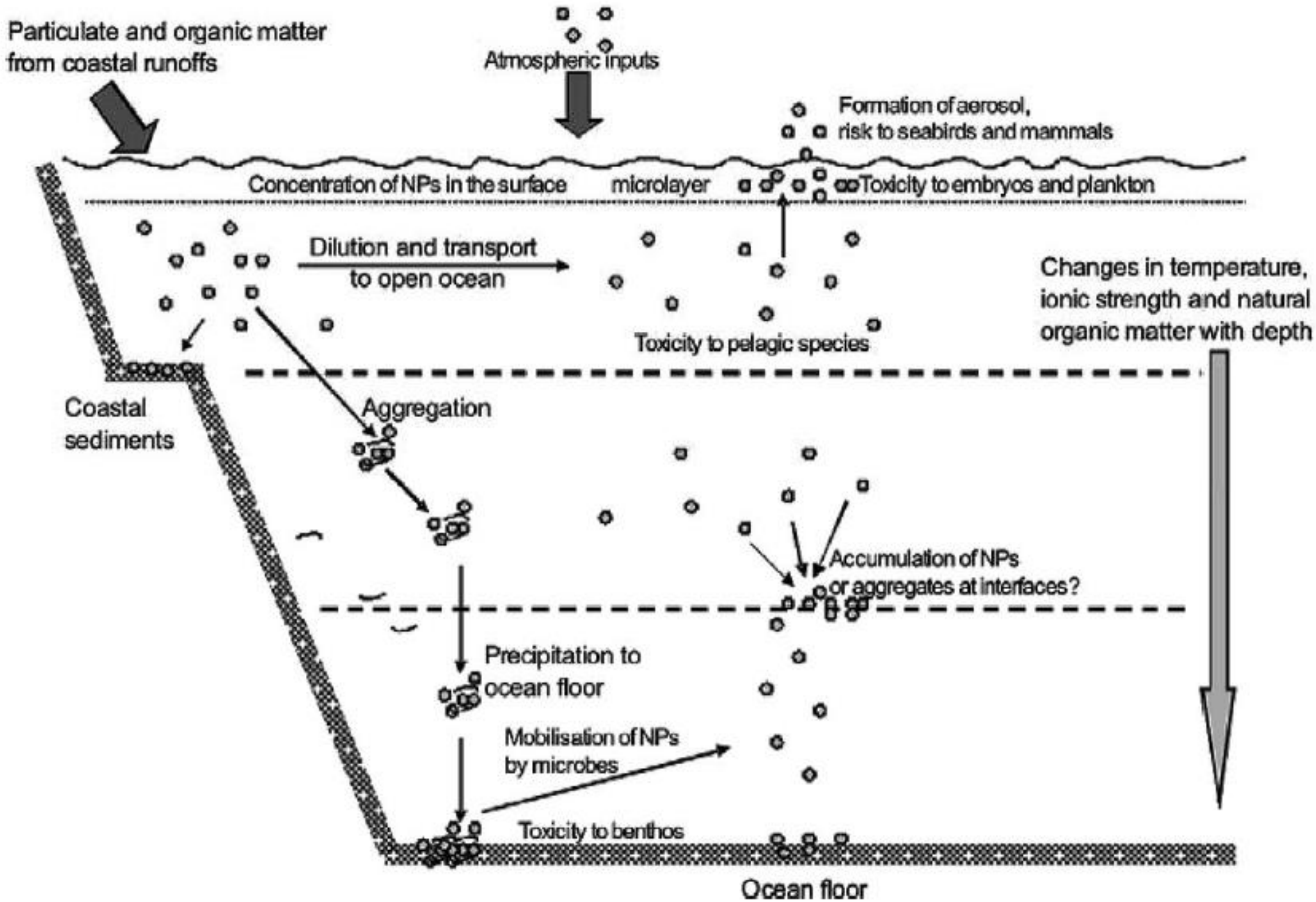
Pakarinen et al., Environ Toxicol. Chem., 2013, pages 1224-1232.

NP Changes in the Environment



Lowry et al., Environ. Sci Technol., 2013

NP Aggregation

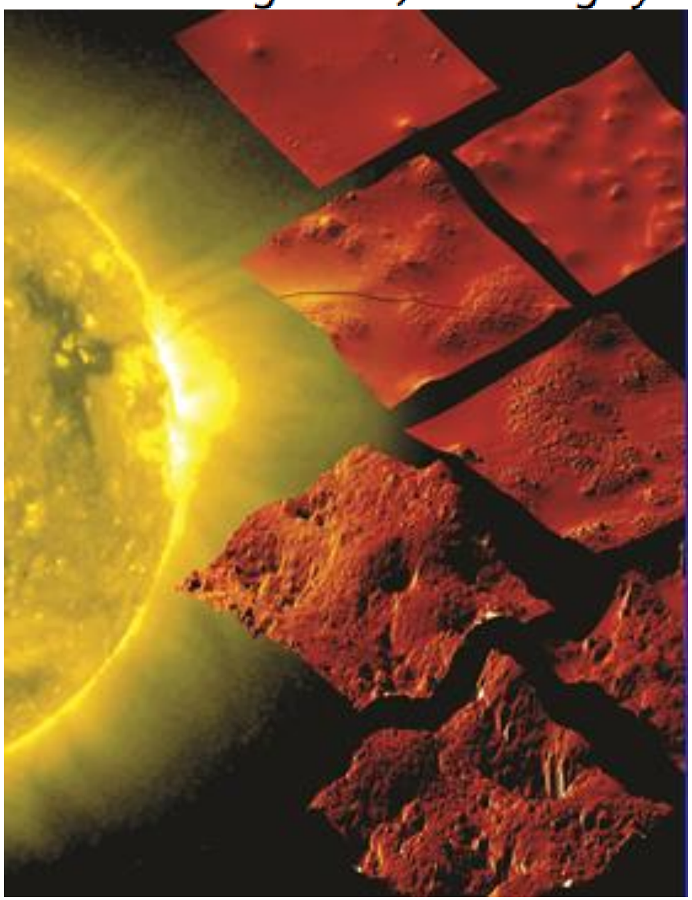


Klaine et al., Environ Toxicol. Chem., 2008, pages 1825-1851.

CARBON 69 (2014) 194–205

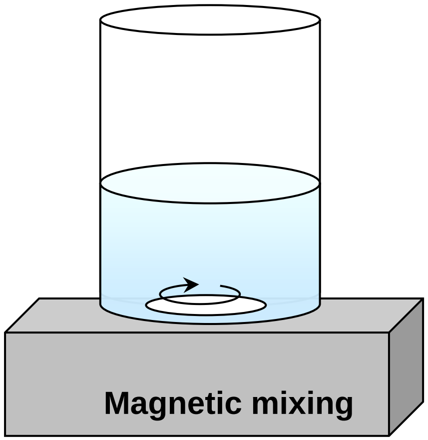
Methods to assess the impact of UV irradiation on the surface chemistry and structure of multiwall carbon nanotube epoxy nanocomposites

Elijah J. Petersen [a,*], Thomas Lam [b], Justin M. Gorham [c], Keana C. Scott [c], Christian J. Long [b,d], Deborah Stanley [e], Renu Sharma [b], J. Alexander Liddle [b], Bastien Pellegrin [e,f], Tinh Nguyen [e,*]



Neat epoxy and MWCNT polymer nanocomposite samples were synthesized, irradiated with UV light, and evaluated using an optimized set of analytical techniques: gravimetry, AFM, SEM, TEM, EFTEM, ATR-FTIR, XPS, and scratch lithography

MWCNT Release Example



stirring for 1 h

Epoxy Resin

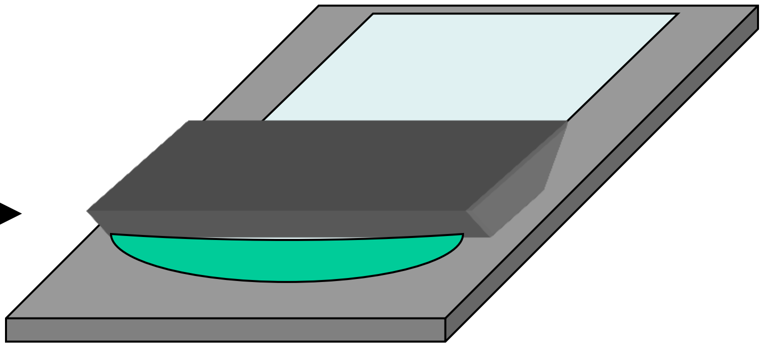
or

5% MWCNT Dispersed in Epoxy Resin

+

Curing Agent

Degas 1 h in vacuum

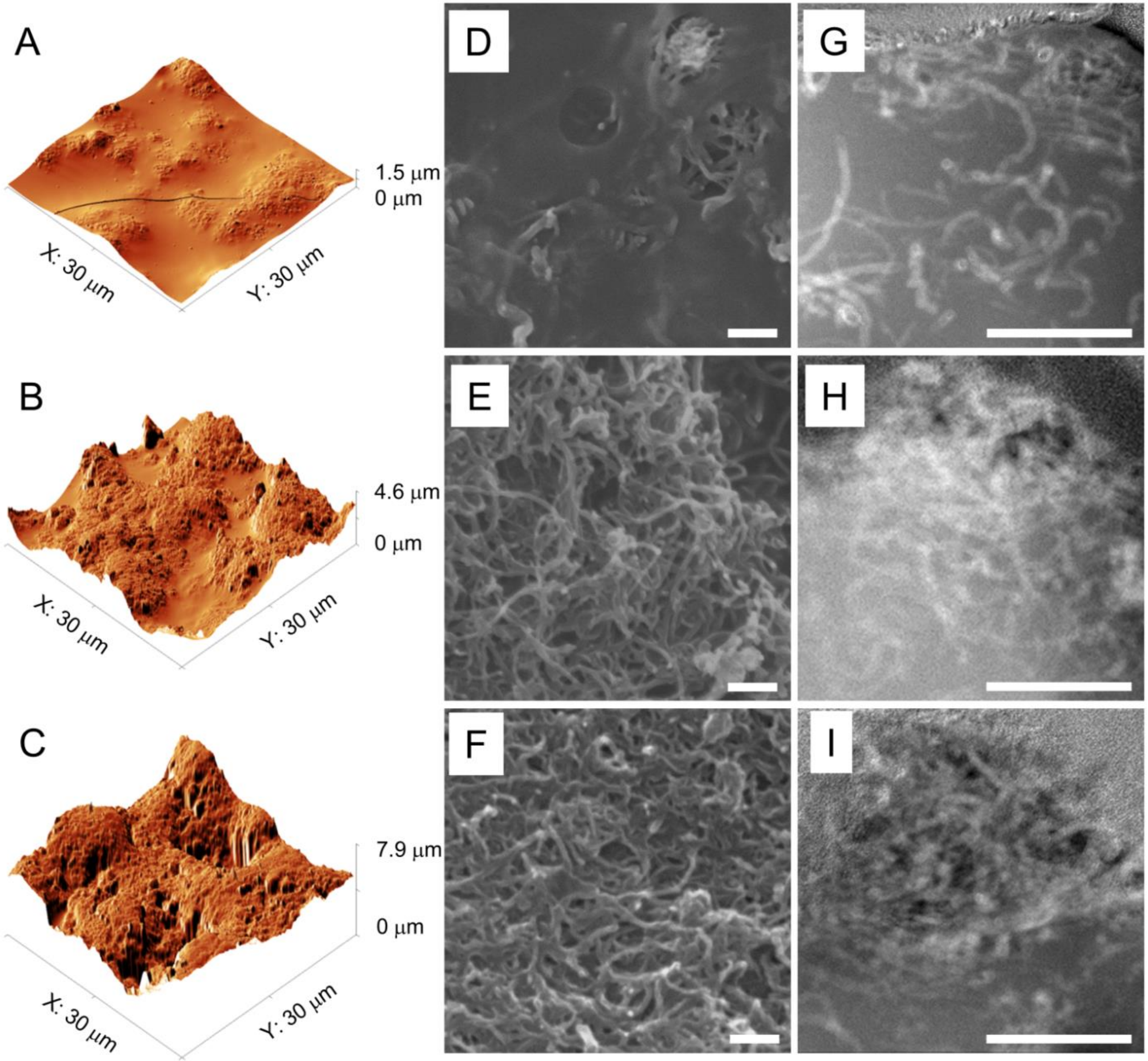


Draw down on Mylar paper

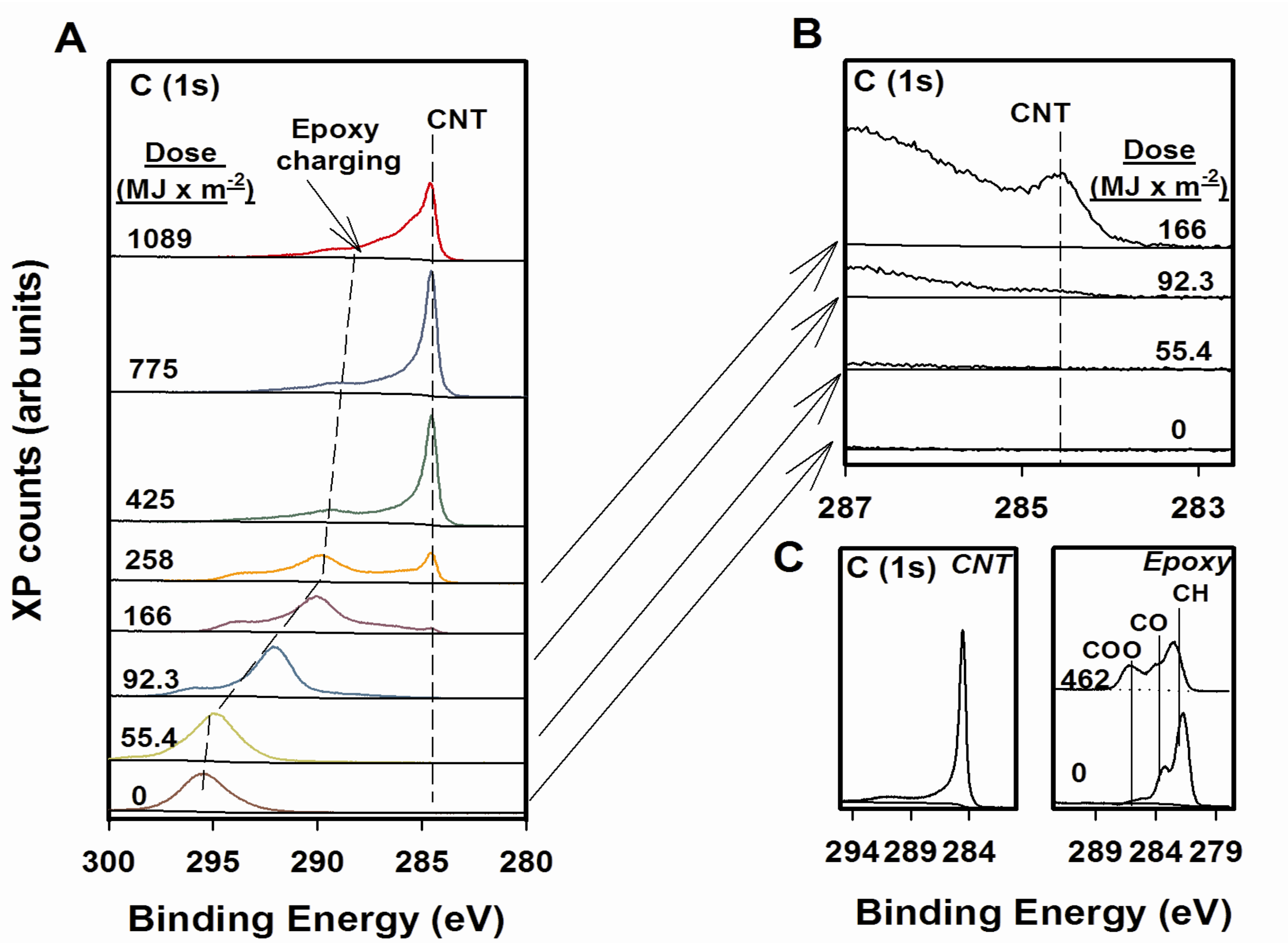
After 4 days at ambient conditions, samples were cured for 1 h at 110°C in an air circulating oven

Petersen et al. 2014, Carbon, 69, pages 194-205

MWCNT Release Example



MWCNT Release Example



MWCNT Release Example