

# Sticky Nanoparticles and Surface Coatings

### What are surface coatings?

- Surface coatings are molecules that cover the outside of particles.
- Sometimes these coatings are polymers (large chains of connected molecules).



nanoparticles



coated nanoparticles

### Why are they needed?

- Surface coatings are needed to keep particles in the nano size range (~1 to 100 nanometers) when they are fabricated and incorporated in products.
- Their function is usually to prevent the nanoparticles from sticking to one another.



Nanoscale particles



Microscale particle

How do coatings affect the stickiness of nanoparticles? • Bare nanoparticles are sticky because of their large surface area relative to

their small mass.

### Exposed surfaces attract

 Surface coatings that are small molecules usually induce a charge on the surface, creating repulsion between nanoparticles.

negative charge



**Electrostatic repulsion** 

 Polymers create a barrier that prevent contact between the particle surfaces.

Barrier



### www.ceint.duke.edu

## What happens to sticky nanoparticles in the environment?







???

• When nanoparticles enters rivers, streams, and groundwater, they can stick to soil, sediment, plants, fish, and other environmental surfaces.

• If the nanomaterials have surface coatings, they are less sticky and capable of dispersing widely in the environment.

## Try it out! Make nanoparticles that don't stick!

