DEPARTMENT OF
Chemistry
UNIVERSITY OF WISCONSIN-MADISON

Ph.D. Dissertation Defense

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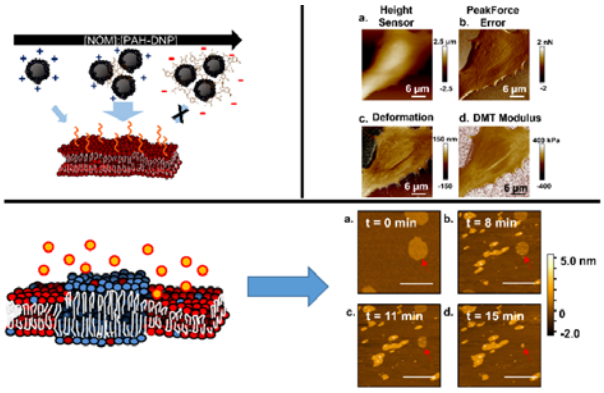
"Characterizing Nanoparticle Interactions at the Cellular Membrane"

As the use of nanotechnology continues to rise, the release of engineered nanomaterials into the environment becomes inevitable. A need exists to understand the implications of engineered nanomaterials and to develop sustainable alternatives as adverse impacts are uncovered. The work presented here focuses on interactions that occur at the cellular membrane, which is hypothesized to be the first point of contact between a nanomaterial and an organism. The characterization of different models for cellular membranes and the characterization of nanoparticle interactions at these model membranes are presented. We investigated the impact of natural organic matter (NOM), which is found ubiquitously in the environment, on the interactions between polymer wrapped diamond nanoparticles and lipopolysaccharide-containing supported lipid bilayers, a model for Gram-negative bacteria cell membranes. To demonstrate the relevance of our model system we extended our study to include experiments using a Gram-negative bacterium, *Shewanella oneidensis* MR-1. Our results demonstrate that the effects of NOM coronas on nanoparticle properties and interactions with biological surfaces can depend on the relative amounts of NOM and nanoparticles. We also examined the impact of polymer wrapped quantum dots (QDs) on supported lipid bilayers containing important biomolecules found in the outer membrane of eukaryotic cells (cholesterol and sphingomyelin).



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