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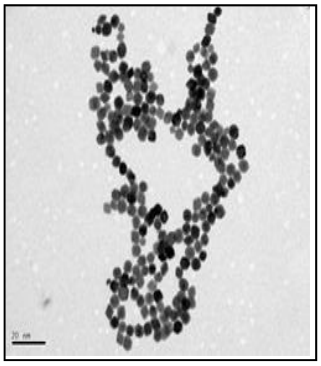
# Professor Kai Loon Chen

**Department of Geography and Environmental Engineering**
**John Hopkins University**

## *Interactions of Carbon Nanotubes and Graphene Oxide with Model Biological Membranes: Implications for Nanotoxicity*



Carbon-based nanomaterials, such as carbon nanotubes (CNTs) and graphene, are gaining much research interest within various fields, including electrical, biomedical, and environmental engineering, because of their unique chemical, mechanical, and electronic properties. With products containing carbon-based nanomaterials already available in the market, it is inevitable that these nanomaterials will eventually be released into the environment. Recently, several studies have shown that CNTs and graphene oxide (GO) can exhibit toxic effects on bacterial and mammalian cells. One of the proposed mechanisms for the cytotoxicity of CNTs and GO is that the carbon-based nanomaterials can damage cell membranes and result in the inactivation of the cells. In order to better understand the interactions between the nanomaterials and cell membranes, the deposition kinetics of multiwalled CNTs (MWNTs) and GO on model cell membranes are investigated in solution chemistries that are relevant to environmental and biological systems. The deposition and release behavior of MWNTs and GO on supported lipid bilayers (SLBs) comprising 1, 2–dioleoyl–*sn*–glycero–3–phosphocholine (DOPC) was investigated using a quartz crystal microbalance with dissipation monitoring (QCM-D). The deposition kinetics are shown to increase with increasing salt (NaCl or $CaCl_2$) concentrations under neutral pH conditions, indicating that electrostatic interactions are likely to play a critical role in controlling the attachment of these nanomaterials to cell membranes. When they come into contact with a supported vesicular layer, no significant damage to the vesicles is observed. Additionally, the use of a fluorescent dye is employed to evaluate the integrity of vesicles when the model cell membranes are exposed to the nanomaterials under favorable conditions for nanoparticle attachment.

Kai Loon Chen is an Assistant Professor in the Department of Geography and Environmental Engineering (DoGEE) at the Johns Hopkins University. Dr. Chen completed his B.Eng. and M.Eng. degrees in Civil Engineering at the National University of Singapore in 2001 and 2003, respectively, and then went on earn his Ph.D. from the Environmental Engineering Program at Yale University in 2008. His current research interests lie in: (1) understanding the fate, transport, and effects of engineered nanomaterials in environmental systems; (2) interactions between engineered nanomaterials and biological membranes; (3) utilizing nanotechnology for membrane filtration processes, water treatment, and environmental remediation; and (4) development of membranes that are resistant to biofouling.

**Host:**
**Prof. Yusong Li**
**Department of Civil Engineering**

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**Friday, February 20, 11:00 am**
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