

Spring 2017 Joint Colloquium

Materials Department & Materials Research Laboratory

Professor Cecilia Leal

Materials Science & Engineering
Frederick Seitz Materials Research Lab.
University of Illinois, Urbana-Champaign



Friday, April 28th, 2017
11:00 am, Elings 1601

Lipid membrane complexity as a handle to activate cellular delivery

Lipid liquid crystalline materials having nanostructures that deviate from the conventional flat bilayer arrangement such as 2D hexagonally packed lipid tubes and bicontinuous cubic phases have been increasingly recognized as relevant materials for the applications of gene and drug delivery, as well as linked to the functionality of organelle membranes. The simple argument that non-lamellar phases have higher surface-to-volume ratios enabling more point contacts with cell surfaces while having a larger encapsulation power to host drug/gene molecules might be insufficient to completely describe the experimental findings.

In this presentation we will show our recent efforts to stabilize topologically active lipid-based colloidal dispersions as well as thin films incorporating bioactive molecules for cellular delivery. We combine i) Small/Wide Transmission/Grazing Incidence X-ray Scattering, ii) Cryo-Electron Microscopy, and iii) Cell Culture methods to demonstrate that a judicious choice of lipid materials allows an incredibly rich phase behavior in bulk, solution, and thin film platforms. Furthermore, the systems can be tailored to be adaptive in response to a number of environmental cues. The general finding is that lipid-based materials comprising negative Gaussian curvature membranes are able to most efficiently deliver their cargo across cell membranes by lowering the energy cost of forming a membrane pore.

Bio

Cecília Leal is an Assistant Professor in the Department of Materials Science and Engineering and the Frederick Seitz Materials Research Laboratory at the University of Illinois, Urbana-Champaign since 2012. She graduated in Industrial Chemistry from Coimbra University in Portugal and received her Ph.D. in physical chemistry from Lund University, supervised by Prof. Wennerström. After working for a year in the Norwegian Radium Hospital, she joined Prof. Safinya's Lab at the University of California in Santa Barbara as a postdoctoral fellow. Her research interests focus on the characterization and functionalization of lipid materials for cellular delivery. She is the recipient of a number of distinctions including the National Science Foundation CAREER award and the NIH New innovator award.

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Hosted by Cyrus Safinya.