

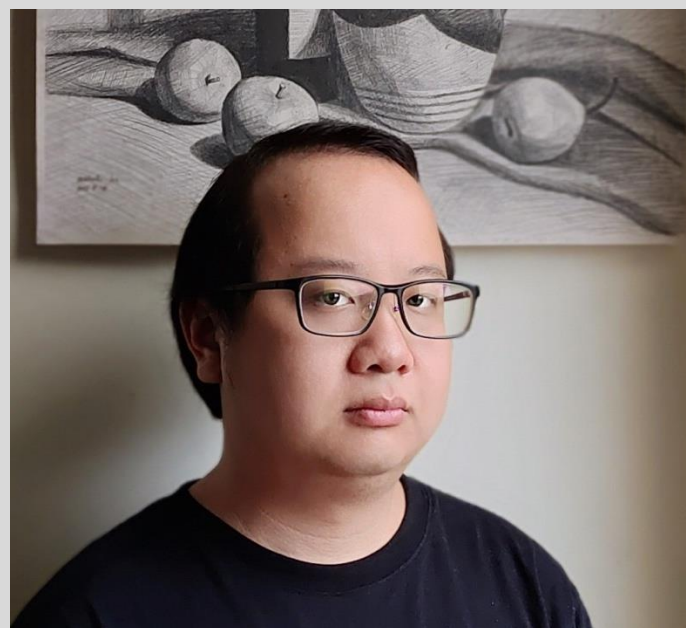
MATERIALS AND BIOMATERIALS SCIENCE AND ENGINEERING

Engineering Surface Interactions for High-Precision Placement of DNA Origami onto Nanoscale Lithographic Patterns

ABSTRACT: DNA origami placement (DOP) uses lithographically generated surface patterns to bind and align DNA origami. Since DNA origami are excellent breadboards for arranging functional nanomaterials with few-nanometer precision, DOP serves as a promising pathway toward integrating nanomaterials within advanced devices. However, progress in improving placement yield and alignment precision has been hampered by limited understanding of how the interactions between the heterogeneous surface and DNA origami drive DOP. To address this challenge, we studied DOP on nanografting-patterned self-assembled monolayers with tailored surface functionality and topography. Atomic force microscopy and modeling revealed that compared to existing hydrophobic passivating backgrounds, a charge-neutral hydrophilic background with tailored topography substantially improves yield, precision, and speed. These improvements arise from increased energetic penalty for misalignment, coupled with a dramatically enhanced surface-diffusion mediated pathway. These mechanistic insights provide a framework for rationally improving DOP to meet the stringent requirements for new nanoelectronic and nanophotonic architectures.

BIOGRAPHY:

Yichen Li is a PhD candidate in Tao Ye Research Group in the MBSE division at UC Merced. He obtained his B.S. degree in Materials Chemistry at Sun Yat-sen University in China in 2018, and M.S. degree in Materials Engineering at University of Southern California in 2020. His research interests in graduate school focus on understanding and engineering the interactions and structures on interfaces by using Atomic Force Microscopy (AFM), especially the interfaces between DNAs and functionalized substrates.



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Refreshments: 1:45pm, Seminar: 2-3pm