

## Marcus Helfrich (Penn State) - DNA nanoparticles: Towards Deterministic Bottom-up Assembly of Metal nanoparticles

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Target architecture: nanowire raft. Synthesis of striped nanowires - templated electrodeposition generated in porous aluminum oxide. Nanowire electrical properties can be controlled by composition to make them conducting, semiconducting, and even photonconducting. Nanowire assembly at the oil/H<sub>2</sub>O interface. 2D rafts form on the mm-scale, raft packing is determined by interparticle interactions. Switch to DNA as an assembly tool because of sequence-based selectivity and reversibility. DNA nanowire conjugates: Fluorescence-based biosensing on striped wires. DNA complementary strands excite fluorescence. Propose examining aqueous-aqueous interfaces - two immiscible polymer solutions, tunable properties/biocompatible, wires collect at the interface, use optical microscope "dipping lenses" for visualization. Rest of talk will focus on 320nm diameter gold wires. Complementary linkers make rafts but without linking strand, no wires, and they are finicky to produce. Nanowire raft formation at the APTS interface. How is wire mobility/hybridization influenced by colloid? Modeling wire behavior with 12nm colloid. Monitor hybridization by measuring color (plasmon) shift. Hybridization thermodynamics: polymers act as volume excluder; increase duplex stability. Chemical effect - PEG and Dextran impact  $T_m$  differently. Production is a balancing act between crowding and electrostatics. Colloid flocculates at high (15%) PEG concentrations in absence of a linker strand. Same effect can be seen in samples prepared in top phase of PEG 8 KDa Dextran and 100-200 KDa APTS. Colloid flocculates above 6 wt% PEG in 8 KDa APTS phase. Reduced salt concentration increases electrostatic repulsion. Can prevent non-specific flocculation through increase in electrostatic repulsion. The viscosity of APTS: you can influence wire mobility by adjusting the viscosity of the polymer solutions. Dextran molecular weight has largest impact on viscosity. Interfacial tensions can be used to determine whether the wires will collect at the interface. Wire mobility at the interface.