4bz Self-Assembly of Functional Structures and Devices for Electronic and Biomedical Applications

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This talk describes the utilization of self-assembly of soft building blocks (surfactants or amphiphilic block copolymers) and hard building blocks (metal nanowires) to form ordered nanostructures. We describe the self-assembly of surfactants or amphiphilic block copolymers into micelles with different shapes such as spherical, cylindrical, or planar, with sizes of tens of nm. Hydrogel films formed using amphiphilic block copolymers were exposed to air of controlled relative humidity, and the equilibrium and kinetics of drying and swelling were studied. These results are relevant to the understanding of drug formulation, drug delivery, and pharmaceutical coatings based on hydrogel films. Single- or multi-component metal (Au, Cu, or Ni) nanowires were fabricated through the sequential electrodeposition in nano-porous alumina or polycarbonate membranes. Using surface tension or magnetic forces these nanowires were self assembled into one-, two-, and three-dimensional structures, that were permanently bonded with adhesives or solders. Finally the utility of the functional assemblies formed will be described with special emphasis on electronic and biomedical applications.