579e Directed Assembly and Fabrication of Metal Nanowires Using Engineered Biopolymers

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In a new approach of biopolymer-based directed assembly of nanoscale building blocks and device fabrication, several properties of bioengineered macromolecules were combined for application in nanotechnology. Specifically, the affinity between the hexahistine (His6) domain of biopolymers and the metal (such as nickel) segment of nanowires was exploited for the directed assembly and fabrication of nano-devices.

An elastin (ELP)-based biopolymer consisting of a hexahistine cluster at each end (His6-ELP-His6) was generated and purified by taking advantage of the reversible phase transition property of ELP. Directed assembly of segmented nickel-gold-nickel nanowires was demonstrated after bridging with high concentration of His6-ELP-His6. The resulting structures were examined by both optical microscopy and SEM. We also demonstrated the directed fabrication of nanowires across two nickel electrodes using the His6-ELP-His6 biopolymer. The corresponding ohmic responses were measured and correlated to the number of bridging molecules.