Ion Mediated “Polymerization” of Nanoparticles: A Platform to Build Novel Devices and Their Application to Cell Biology*

An exciting feature of nanotechnology is that between 1 and 100 nm length scale the behavior of a system or material becomes size dependent opening unique possibilities. For example, at cryogenic temperatures, current through one or an array of ~10 nm nanoparticles is non-Ohmic due to local charging by a single electron. I will describe an array of 10 nm Au nanoparticles made by directed self-assembly to form a two dimensional (2D) network of one dimensional (1D) necklaces. The “polymerized nanoparticle” necklaces exhibit a robust single electron effect at room temperature. Furthermore, by modulating the electrical double layer around the necklace array, we have demonstrated the first single electron transistor operating in water. In this talk, I will describe the electrical, optical, and magnetic characteristics of these systems and their applications to biology, especially photosynthesis.

ABOUT THE SPEAKER

Ravi Saraf is a professor of chemical engineering at the University of Nebraska-Lincoln. Prior to moving to the Midwest, he spent four years at Virginia Tech and about ten years at IBM’s T.J. Watson Research Center. He earned his Ph.D. in polymer science from the University of Massachusetts, Amherst and a B. Tech in Chemical Engineering from the Indian Institute of Technology, Kanpur. His current research interest is in single electron devices and electrochemical systems.

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