



Plenary 19

Biomolecular Nanostructures - Functional "Smart" Materials for Sensing, Machines,  
Computing and Nanocircuitry

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The evolutionary optimized recognition and catalytic properties of biomolecules are recently implemented to tailor functional nanostructures that act as sensors, biomolecular machines, computing systems and nanocircuitry. Hybrid nanoparticle-biomolecular systems and supramolecular biomolecular nanostructures provide functional nano-structures for the development of the emerging field of nanobiotechnology. Recent advances of our laboratory in developing different facets of nanobiotechnology will be described:

1. The assembly and electrical contacting of redox enzyme by means of Au-nanoparticle-enzyme conjugates on electrodes will be described. Also, the electrical contacting of redox enzymes by means of the mechanical shuttling of a relay unit will be presented.

2. Chemically modified semiconductor quantum dots provide functional units for the optical monitoring of enzyme activities, and for the sensing of explosives and metal ions.

3. Supramolecular nucleic acid nanostructures are used as organized systems for sensing, for the activation of DNA machines and as switchable DNAzymes.

4. Pre-designed nucleic acids self-assemble into nanostructures that act as templates for the programmable association of redox-active and photoactive components or enzymes. Vectorial electron transfer, photoinduced electron transfer and the activation of enzyme cascades were accomplished on the DNA templates.