

Multi-functional and heterostructured nanosystems for advanced nanobiotechnologies

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Multi-functionality at nanoscale for biological applications is a critical challenge due to limitations of material and architecture development at nanoscale. This also implies that developing multi-component nanomaterials is necessary as synergistic effects of various materials and nanostructures can be achieved in such nanosystems. In this talk, I will be discussing some of the major advancements from my research group in the area of nanoscale heterostructures and their potential for advanced nano-biotechnologies. The emphasis will be on 1-D nanostructures coated with metal or metal oxide nanoparticles, their fundamental growth mechanisms, and characterization. Furthermore, such heterostructures were impregnated within soft matrix for applications in molecular detection, separation, and delivery. In regard to the nanoparticle coating on 1-D nanostructure surface, a unique material development will be discussed emphasizing efforts in combining 1-D nanostructure, graphene, and plasmonic nanostructures. The studies relating to their applications in chemical and biological sensing, plasmonics, and higher order bio-assemblies will be presented. The talk will strongly indicate the University of Alabama's abilities and research infrastructure in the area of exotic material development and impact on nano-biotechnologies.