Biomedical and Nanomaterials Capabilities at ATIC Innovation Center

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We describe the research and development activities in Nanotechnology at the Advanced Technology and Innovation Center, ATIC, of the Universitat Rovira i Virgili of Tarragona:

BIOTECHNOLOGY and ENVIRONMENT: Surface modification of surfaces via electrodeposition of modified nanoparticles (NPs) for micro-systems applications in biotechnology, health, environment, etc. Size controlled in situ deposition of Au, Pd and mixed Au-Pd NPs for enhanced catalysis. Surface immobilized NPs for a more environmental friendly oxidation of primary alcohols to aldehydes, and for CO oxidation to CO2.

HEALTH: Biosensor arrays housed within integrated microsystems for the early detection of disease. Example 1: Low cost microsystem for use at the point-of-care for the biopsy free diagnosis & monitoring of celiac disease via combined HLA-typing and serology measurement, with automated actuation and assay time under 15 minutes. Example 2: In post-surgery/radio/chemo-therapy, circulating rare cancer cells are isolated from blood for an early detection of metastasis, moving towards theranostics and individualized medicine according to the patient's RNA expression profile. Example 3: Nanoliposomes for targeted drug delivery to cancer cells, functionalized with specific antibodies.

BIOINFORMATICS: The characterization and modeling of the potential toxic effects of nanoparticles requires the use of advanced computational techniques. Our expertise in the application of data mining schemes and machine learning to analyze nanoparticle data is applicable a variety of industrial processes as well as in environmental monitoring of nanoparticle effects.

FLUIDS TECHNOLOGIES: Electrospinning, electrospray and other liquid atomization / spraying methods are used to produce pharmaceutical NPs and for their controlled deposition, to synthesize thin films and powders of polymers, oxides, pharmaceutics etc. Electrospun fibers can be used for filtration, or as templates for tissue engineering.

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