

NANOSTRUCTURES AS ANALYTICAL TOOLS IN BIOASSAYS

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The integration of nanotechnology into bioassays is having a great impact with the development of new nanostructures, nanodevices, nanomaterials or, in general, nanoparticles (NPs), such as nanoshells, nanowires, nanotubes and nanobarcodes, of a variety of shapes, sizes and composition [1-4]. These NPs, which exhibit new properties that are not shown by the bulk matter, are being considered as an alternative to conventional reagents, such as enzymes or organic molecules, often used in bioassays. The main reasons of this success can be ascribed to their ability to improve the features of these assays, allowing their miniaturization and expeditiousness, reducing reagent and sample consumption, and facilitating the performance of heterogeneous formats. NPs present a larger surface area for the display of receptors than flat surfaces and the reactions are faster and more sensitive.

A critical evaluation of the real usefulness of different nanostructures described as labels, nanoscaffolds or separation media in immunoassays and nucleic acid hybridization assays is presented. In spite of the great number of publications, there is a relatively high percentage of them that only describe theoretical aspects related with the use of these nanostructures or nanoparticles, but do not verify their applicability in the presence of potential interferent agents that can be present in the sample matrix. This work attempts to carry out a systematic study of the advantages and limitations of the use of these new reagents in bioassays, the different assay formats described for the individual and multiplexed detection, and the capability of these assays to analyze real samples.

References:

- [1] M. Magliulo, E. Michelini, P. Simoni, M. Guardigli, A. Roda, *Anal. Bioanal. Chem.* **384** (2006) 27.
- [2] M. Seydack, *Biosens. Bioelectron.* **20** (2005) 2454.
- [3] N.C. Tansil, Z. Gao, *Nanotoday* **1** (2006) 28.
- [4] A. Merkoçi, *FEBS J.* **274** (2007) 310.