Physical view of biomolecular interactions in nano-technological applications.

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Common Bio-Nanotechnological designs for specialized applications can be highly benefited from particular biophysical assays dealing with molecular interactions. Indeed, providing a basic knowledge of the interactions involved in nanostructural assembly is a key aspect in the improvement of any design.

We would like to present different methodologies used successfully in the physics of DNA/RNA assembly for biotechnological applications:

A molecular probe for nano-scale short RNA and DNA fragments using high intensity UV laser pulses and the chemistry of the guanine radical has been developed. This technique is able to report structural information, dynamics and intra-base conformation within a nucleic acid molecule. It has shown to be a valuable tool in the study of *"puzzle"* pieces of gene regulation and in the synthesis of specific gene silencing oligomers to be delivered by organic nanoparticle approaches.

Complementarily we will focus in the discussion of several nano-calorimetry studies about DNA/RNA based hairpin nano-structures and their particular assemblies as bio-cellular sensors and drug delivery agents. We present thermodynamical results on hairpin and loop structures, with drug binding and release analysis.
In addition, full atom molecular modeling of basic hairpin structures has been also used as a valuable source of information for practical design.