nnovation in nanomedicine through materials nanoarchitectonics: Facts and Challenges

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Advances in nanomedicine over the last decade call for new means of drug delivery and new diagnostics tools. It has been suggested that synergistic combinations of several material components or structural features can spur the development of more effective delivery systems [1]. Also, by controlling simultaneously the size, shape, and targeting ability of a nanoparticle, one can achieve substantial enhancement of drug delivery towards specific pathological sites[2]. From the practical view point however, it can be quite challenging to convert individual nano-objects into multifunctional and integrated drug delivery systems.

Current and anticipated functions in nanomedicine of self-assembled and hybrid nanoparticles will be presented within the framework of Materials Nanoarchitectonics [3,4], a strategy designed to stir innovation in nanotechnology and tp facilitate the necessary shift within classical materials science as it is faced with the challenge of creating new devices starting from nano-objects endowed of unique properties. The approach shuns the conventional analytical aspects of nanotechnology in favor of a synthetic view conducive to innovation. It is intended to lead to integrated assemblies that display concerted functions by virtue of mutual interactions among their units (Figure 1).

References

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Figures

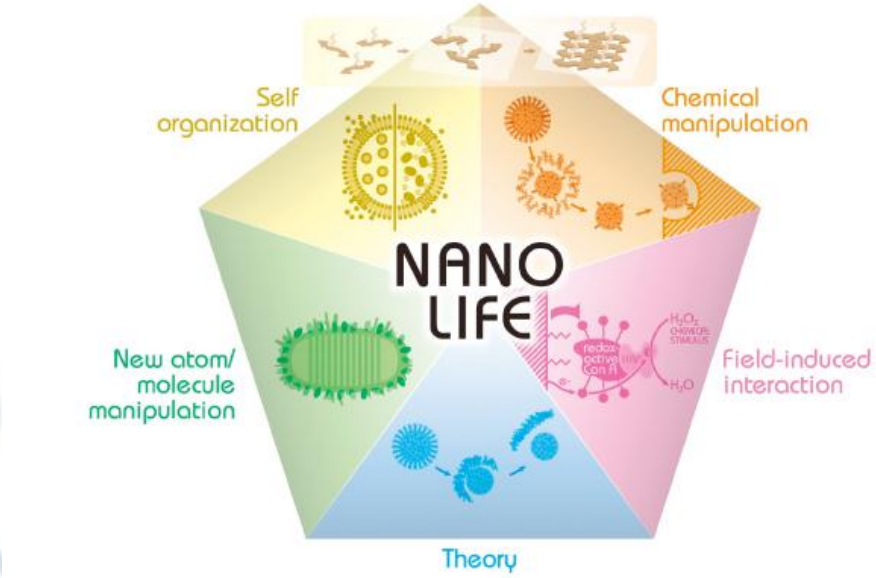

Figure 1: Materials nanoarchitectonics offer an integrated approach for the design, exploration, and fabrication of new nanomaterials for biology, medicine, and pharmaceutical applications, encompassed here in the term "Nano-Life". It is based on five pillars: self-organization, chemical manipulation, new atom/molecule manipulation, field-induced interaction, and theory (from ref. 3).