

Targeted functional Nano-, Micro-, bio-swimmers for biotechnology and life science applications

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ABSTRACT

In this communication, it is intended to present and discuss about how natural, synthetic Bio-structures, and Nanotechnology could provide versatile platforms to develop functional and Multi-functional structures. In the design multidisciplinary Research it is involucrad where chemistry of Nanosurfaces and micro-sized as well could tune interactions and further incorporations. Moreover, Bioconjugation and genetic engineering could participate as well to tune matter compositions and properties. Therefore, in this case the Biostructure is not the target; at the place is part of the functional Biomaterial to deliver targeted properties. Thus, the design of Nano-Biostructures based on knowledge from different Research fields and sources such as Nanomaterials, Nanotechnology, Biomaterials, Biochemistry, and Biotechnology are required. While the targeted functions could cover a wide overview that it is highlighted in the presented analysis.

Keywords: Nanotechnology, Biotechnology, Nano-Biostructures, Micro-machines, Hybrid Nano-Biostructures, Functional Nano-Biostructures, Nano-Bio-platforms.

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Introduction

Advances of Nano-Bio designs for targeted functional structures: The Nanoscale is incorporated within living systems by varied forms such as proteinic structures, enzymes, extracellular vesicles, viruses and further Nanoaggregates and assemblies with varied functions and illness as well (Ame and Bracamonte, 2020). Moreover, it is known that varied micro-organisms should be detected for many reasons in the context of health problems and early diagnoses. Therefore, the importance of the Micro-organisms detection, and analysis of these micro-structures, by different methodologies it is well known that have a relevant importance in many areas within Analytical Chemistry developments as Clinical Diagnosis, Biochemistry, Environmental Chemistry, as well as another ultrasensitive analytical methodologies by applying non-conventional advanced instrumentation for Biophotonics, Ultrasensitive Diagnostics, genomics (Bracamonte, 2022) and Nanomedicine (Bracamonte, 2023).

However, not always the target is Biological structure. The Biostructure in many cases is the support and provide the targeted function up on need.

In this regards Biotechnology and Nano-Biotechnology is currently affording to many Research studies focusing attention on the development of new functions and uses within Life Sciences. Thus, the Biostructure forms part of the solution for a given targeted application. In this context, it is highlighted the importance of genetic engineering to modify Biostructures adding required characteristics for the function. Otherwise it should be added by other type of strategies such as the use of Bioconjugation techniques, and Nanotechnology, etc. In this regard, it is of high interest the study of interactions of new Nanomaterials with Bacteria and varied Micro-organisms in order to be applied as Nanolabellers to tune functionalization.

In these perspectives, it could be highlighted targeted Functional, and Multifunctional natural, synthetic Biostructures and Nano-Biostructures. In this context as well it should be noted Research field of synthetic Biology that could permit to mimics natural ones but modified up on needs. It

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is mentioned; i) biomachines for genomic material synthesis and reparations such as developed by CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats), ii) Cargo loaded Biostructures, iii) Carriers, iv) Bio-catalyzers, v) new functional Nano-Biostructures determined by pre-designed individual components joined for synergic effects, vi) Nano-Enzymatic engines, vii) Bioluminescent structures, viii) synthetic Nano-Biolasers, and ix) other structures such as Micro-swimmers, drug delivery systems, and Bio-detectors, etc ((Bracamonte, 2023). As, it could be seen, there are a wide overview of potential functions and challenges related (Palacios et al., 2023). But, for all these developments should be achieved strong Nano-Biostructure strengths (Palacios and Bracamonte, 2022). So, extra functions from the Nanotechnology point of view towards Biotechnology it could be as for example simple protection of vaccines and functional Biostructures that should arrive to the pre-designed target. In these perspectives, in this communication it was intended to highlight these new trends in Research and current developments under focus.

Concluding remarks

So, by joining multi-disciplinary Research fields and knowledge associated it could be designed synthetic Biostructures or Hybrid ones to develop functional Biomaterials. Therefore, the natural or synthetic Biostructure is platform or support as well as contain function joined to Nanoarchitectures that could provide additional properties too. In this regard Nano-Biostructure is not target, at place is functional device (Salinas and Bracamonte, 2018) that it permits to deliver and act by smart mechanism that should be pre-designed. This could be part of challenge and it is up of needs to consider these types of approaches for high precision Life Sciences applications (Khiing et al., 2024).

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