SURFACE MODIFICATIONS AND MORPHO-STRUCTURAL INVESTIGATIONS OF GRAPHENE OXIDE FOR HIGH-PERFORMANCE OSTEOGENIC DIFFERENTIATION BIOMARKERS DETECTION

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The focus of this study was to understand key interactions between single stranded DNA (ssDNA) and various graphene oxide (GO) species, more specifically, their susceptibility to the impact of common processing techniques of graphenic materials. 2D nanomaterials like GO have raised interest for the fabrication of innovative designs which open up almost limitless possibilities due to their remarkable properties (surface charges, wettability, monolayer architecture) [1] [2] and have been investigated as promising supports for biomolecule adsorption and immobilization in sensors manufacturing [1] [3]. Reproducibility is a key aspect we had aforethought in the design and fabrication of graphenic biosensors; synthesis route is one of the key factors that could lead to various defects of the GO structure while the GO topography, chemistry and, ultimately, GO-biomolecules interaction, could be altered post-synthesis through handling, exfoliation and preparation protocols Hence, the performance of GO was thoroughly audited via a full set of tests focused on quantifying the sonication induced physico-chemical modifications. Structural and morphological changes were recorded by means of Raman spectroscopy (RS), Fourier transform infrared spectroscopy (FT-IR), atomic force microscopy (AFM), optical (OM) and electronic microscopy (SEM/TEM) for GO sampled at different sonication times. Having a better understanding of the biosensor substrate, in terms of handling and preparation techniques, preliminary tests regarding the interaction of GO with biomolecules were carried out. The evaluation of the affinity ssDNA manifests towards the GO substrate was assessed according to two different references: structural modifications induced by sonication and GO functionalization. Encompassing an integrated knowledge of molecular biology and material science, it is to our anticipation that the output of our experiments are soon to fill some of the gaps in the reported understanding of stem cells differentiation and coalesce to a revolutionary common practice in biosensor manufacture industry.

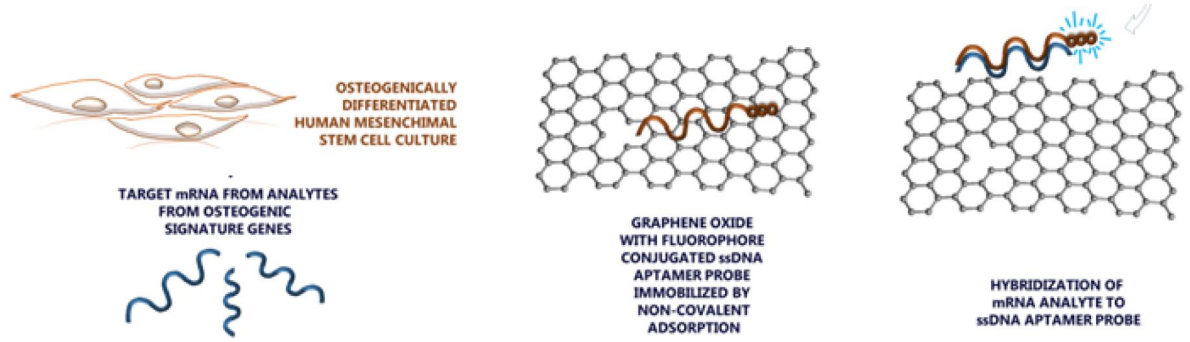


Fig. 1. Graphene oxide- single stranded DNA (ssDNA) interaction and ssDNA hybridization with complementary mRNA probe.

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