Bioimaging of liver cancer cells incubated with partially reduced graphene oxide

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Functional materials based on graphene oxide (GO) and reduced graphene oxide (rGO) have a high potential for application in the fields of biophysics, material science, and biomedical engineering [1]. It is due to their tunable physical properties, high surface area, remarkable photoluminescence, as well as their controllable chemical functionalization [2]. Beyond their applications in nanomedicine for drug/gene delivery, phototherapy and bioimaging, they have shown significant interaction and adhesive properties with proteins, mammalian cells and microorganisms, which makes them potential candidates for multifunctional biological applications. In this lecture, we will present a study of the interaction of partially reduced graphene oxide (prGO) with Huh7.5.1 liver cancer cells. The study was conducted by means of synchrotron excitation DUV fluorescence bioimaging (performed on DISCO beamline of synchrotron SOLEIL) [3]. The prGO sample was obtained by the reduction (to a certain extent) of the initially prepared GO nanosheets. The fluorescence of the GO nanosheets increases with time of the reduction due to a change in the ratio of the sp^2 and sp^3 carbon sites, and the prGO sample was extracted from the dispersion when the intensity of the fluorescence reached its maximum. After that, Huh7.5.1 cells were incubated with GO, prGO and rGO nanosheets and used in bioimaging studies. The presence of graphene materials influenced the fluorescence properties of the cells, and by analyzing fluorescence photobleaching dynamics, we were able to localize graphene nanosheets inside the liver cancer cells.

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