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Partially reduced graphene oxide as a fluorescent probe and its interaction with liver cancer cells: DUV imaging study

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Partially reduced graphene oxide (prGO), an intermediate form between graphene oxide (GO) and graphene, was studied as a potential probe for fluorescent bioimaging of cancer cells. prGO material was obtained by the reduction of the initially prepared graphene oxide nano-sheets with hydrazine. The fluorescence of the GO sheets increases with time of the reduction due to change in ratio of the sp^2 and sp^3 carbon sites. It was found that the fluorescence intensity reached its maximum after reduction for six minutes and the prGO sample was extracted from the dispersion at this particular time. After that, the reduction process was left to proceed further to saturation until highly reduced graphene oxide (rGO) was obtained. Scanning transmission electron microscopy coupled with energy dispersive spectrometry (STEM-EDS) was used to study the morphology and structure of the GO, prGO and rGO samples. Their optical properties were investigated by UV-vis and photoluminescence (PL) spectroscopies. The fluorescent GO, prGO and rGO nanosheets were used in the DUV fluorescence imaging studies of the cancer liver cell line Huh7.5.1, which were performed on DISCO beamline of synchrotron SOLEIL. The internalization of prGO sheets by the cells resulted in a strong increase in the intensity of fluorescence signal, which was 2.5 times higher than the intensity of the autofluorescence of the control sample. Also, time-lapse fluorescence microscopy experiments showed that the dynamics of the fluorescent signals changes after incubation of the cells with GO, prGO and rGO sheets. The prGO nanostructure was suggested as a possible carrier for cancer drugs, since it could be easily conjugated with aromatic ring containing molecules.

Biography

Vladimir Djokovic has completed his PhD in Physics at University Belgrade, Faculty of Physics in 1999. He spent two years as a Postdoctoral Fellow at University of the Free State, South Africa. In the last couple of years, he was a Visiting Professor/Researcher at NASA University Research Center, North Carolina Central University. So far, he has published two book chapters and more than 60 papers in ISI journals. He is a Leader of Polymer Nanocomposite group at Vinča Institute from 2005 and a Professor of Polymer Physics in the Faculty of Physics at University of Belgrade.

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