Graphene oxide nanoplatform for cancer-targeted therapy

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The increasing interest in the remarkable 2D materials, graphene, and its modifications lead to many possible and interesting applications. It is due to extraordinary properties of graphene, which makes it sensitive to the environment and preordain it to electrical responsive sensors [1]. The oxidized form of graphene, graphene oxide (GO) is covalently decorated with oxygen-containing functional groups, resulting in sp2/sp3 hybridization and different oxidation degree. The better reactivity and hydrophilic character designate the GO for biological and medical use in targeted therapy. GO nanolayers were prepared at our department by modified Hummers and Offeman method from exfoliated graphite, after several centrifuge and ultrasonic cycles. Basic characterization of GO in terms of the degree of oxidation, exfoliation and nanoparticle size was determined by physical and chemical analyses, as X-ray photoelectron spectroscopy (XPS), Raman spectroscopy and atomic force spectroscopy (AFM).
Diagnostics of oncological diseases stays at the forefront of the current medical research. A large number of oncological markers is available for the early diagnostics. The CA IX (Carbonic Anhydrase IX) is a cell surface, a hypoxia-inducible enzyme that is expressed in aggressive tumors, hence, it can be used as a tumor biomarker [2]. Herein we propose a nano scalable graphene oxide platform functionalized with magnetic nanoparticles and the monoclonal antibody specific for the CA IX marker. The antibody specific to CA IX linked via an amidic bond to the poly-L-lysine cover of magnetic nanoparticle. Prepared GO-based platform targeted to hypoxia cancer cells, with magnetic nanoparticle combined with the biosensing antibody element are contrast agents, which will provide cancer biosensing and bioimaging based on magnetic resonance (MR) effect, for the future non-invasive *in vivo* application.

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References

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