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Investigation of radical formation on chemically modified graphene oxide under near infrared irradiation

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Within the different classes of carbon materials, graphene family materials have gained a lot of consensuses as tools in cancer therapy. These two-dimensional materials are good photothermal absorbers in the near-infrared (NIR) region.[1] Graphene oxide (GO) is the oxidized form of graphene. The Hummers oxidation process of graphite enriches the graphene surface with a wide variety of organic groups such as epoxides, hydroxyls and carboxylates, leading to a good colloidal stability in water and allowing to introduce anchoring points for covalent functionalization.[2] GO is also endowed of defects and unpaired electrons that make its surface highly reactive by generation of radicals.[3] Moreover, it has been shown that GO radical formation can be induced by heat and it can be activated by NIR irradiation.[4] In this work, we investigated the mechanisms of radical generation on different functionalized GO conjugates in the context of a treatment against cancer cells. The covalent functionalization relies on Diels-Alder modified molecules covalently grafted by epoxide ring opening onto the surface of GO through an amino moiety. Both pristine and functionalized GO were irradiated by a NIR laser and radical production was investigated with different probes, analyzed by fluorimetry and electron paramagnetic resonance. The radical species were then exploited in cancer treatment by *in vitro* experiments on a breast cancer cell line (Figure 1).

References

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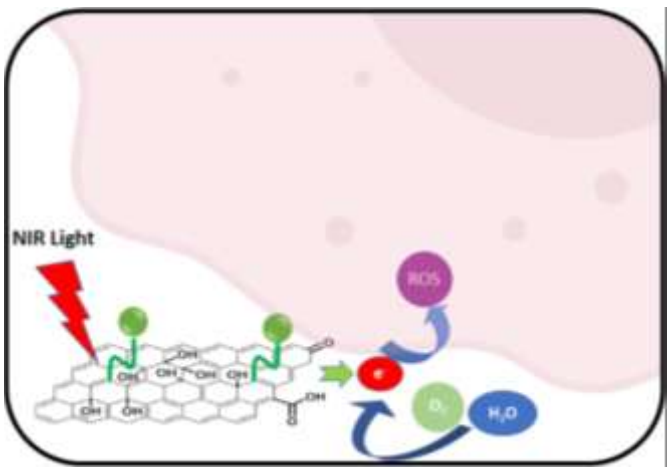

Figure 1: Covalently modified graphene oxide to modulate ROS generation under near infrared irradiation for anticancer treatment.