

Noncovalent interaction between 5,10,15,20- tetrakis(4-(hydroxyl)-phenyl) porphyrin and graphene oxide

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Noncovalent hybrids of graphene oxide and porphyrins are noted for photoinduced electron transfer. This property is useful in many research areas, including photocatalytic hydrogen production.^[1,2,3] Noncovalent nanocomposite of 5,10,15,20-tetrakis(4-(hydroxyl)-phenyl) porphyrin (TPPH) (Fig.1) and graphene oxide were synthesized and characterized by stationary and time-resolved absorption and emission spectra. By functionalizing TPPH to graphene oxide sheets nanohybrid with the needed charge-separation properties should be obtained. The development of novel graphene-based materials might be very useful especially in the context of the possible application in solar fuel generation.

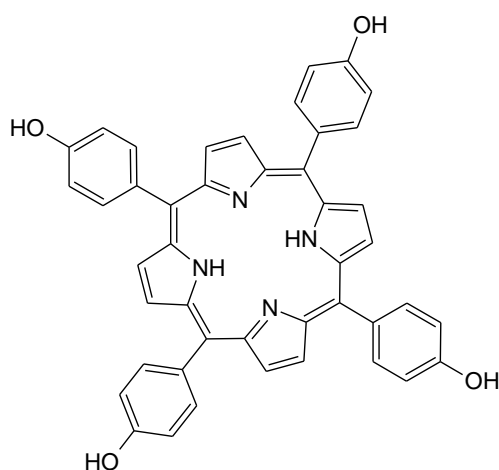


Figure 1. The molecular structure of TPPH.

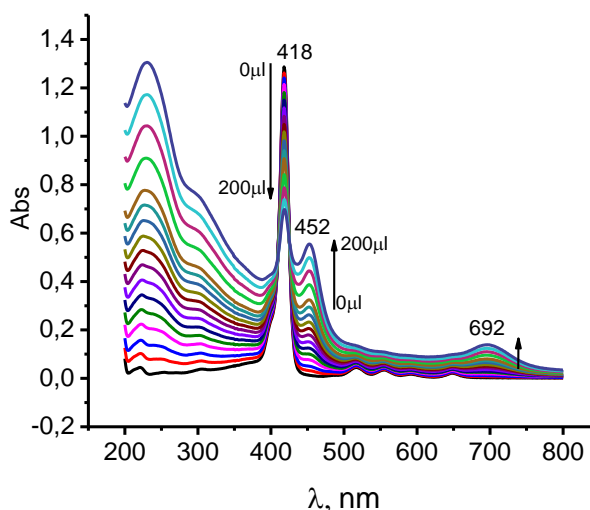


Figure 2. Absorption spectra recorded during addition of 0.4 mg/ml aqueous suspension of GO (0-200 μ l) to 3 μ M TPPH in 3 ml of ethanol:water (1:2 v/v).

After adding progressively graphene oxide to the TPPH solution, the Soret band red-shifts from 418 nm to 452 nm and new absorption band at 699 nm appears (Fig.2). Also, Q bands, characteristic bands for porphyrins, get less intense. The fluorescence emission of the TPPH is quenched by the addition of GO and no new emission band is built. Changes in the

absorption spectra and fluorescence quenching proclaim that interactions between graphene oxide and TPPH molecules occur already in the ground state. These interactions cause static quenching of TPPH emission as evidenced by the no shortening of TPPH fluorescence lifetime with the GO addition. Surprisingly, fluorescence has not been detected for the TPPH-GO nanohybrid what indicates that very fast deactivation process takes place.

Changes in absorption spectra after addition of GO were also recorded for porphyrin with –OMe groups in phenyl substituent (5,10,15,20-tetrakis(4-methoxyphenyl)porphyrin). For both porphyrins, the observed changes are very similar and it could mean that nanohybrids are formed mainly because of π - π interactions, rather than hydrogen bonds.

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