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Up/down conversion of carbon dots in polymeric film and liquid state applied as a prooxidant agent

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The luminescent carbon nanoparticles (Carbon Dots or CDs) exhibit excellent optical properties with emission in the visible spectrum, good dispersion in water, low toxicity and multifunctional applications, such as their use as polymeric films and pro-oxidant agents in biological systems [1,2]. Therefore, this work aims to synthesize and characterize CDs in solution and polymeric film to evaluate their down- and up-conversion properties and singlet oxygen generation. The Carbon Dots were obtained from o-phenylenediamine (CD-OPD) via the hydrothermal method (200 °C/ 4: 30 h) and the CD-OPD-based film (CD-OPD-F) was produced using PVA (poly (vinyl alcohol)) and glycerol. To evaluate the generation of singlet oxygen, a study was carried out on the degradation of DPBF (1,3-Diphenylisobenzofuran) in the presence of CD-OPD. The solution was exposed to 650 nm laser radiation (50 mW) for 10 min and then the absorbance was monitored at 413 nm. The CD-OPD showed an average size of 2.64 ± 0.60 nm and a graphitic structure with interplanar distances of 0.24 nm (Fig.1(a)). In addition, the CD-OPD showed emission independent of the excitation wavelength (λ_{Exc}) with a maximum at 550 and 558 nm in the down- and up-conversion system, respectively (Fig 1. (B) and (c)). The CD-OPD-F showed emission at 530 nm for down- and up-conversion studies (fig. 1. (d) and (e)), with a slight hypsochromic shift concerning the CD-OPD, due to the different environments. In addition, Fig. 1 (f) shows the degradation of DPBF in the presence of CD-OPD (100 µg mL^{-1}), which exhibited a degradation percentage of 45.82% over the time analyzed. Finally, the results obtained indicate that CD-OPD and CD-OPD-F are promising platforms for acting as pro-oxidant agents, in the down- and up-conversion way.

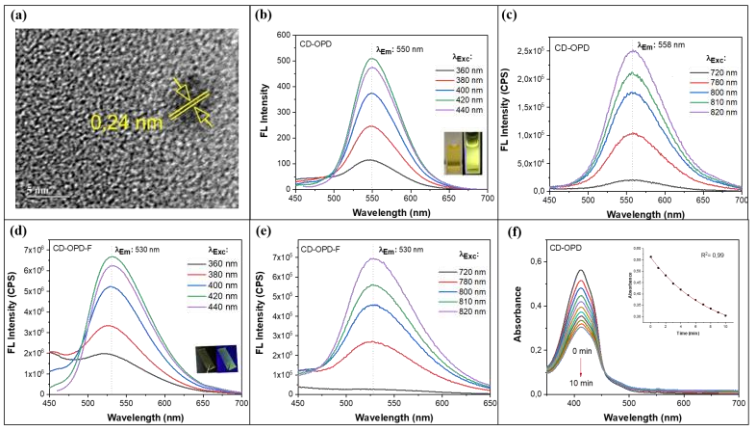

Fig. 1. (a) TEM; Photoluminescence of CD-OPD (b) (c) and CD-OPD-F (d) (e); (f) degradation of DPBF in the presence of CD-OPD.

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References

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