Photophysical properties of carbon nanomaterials from wet pomace

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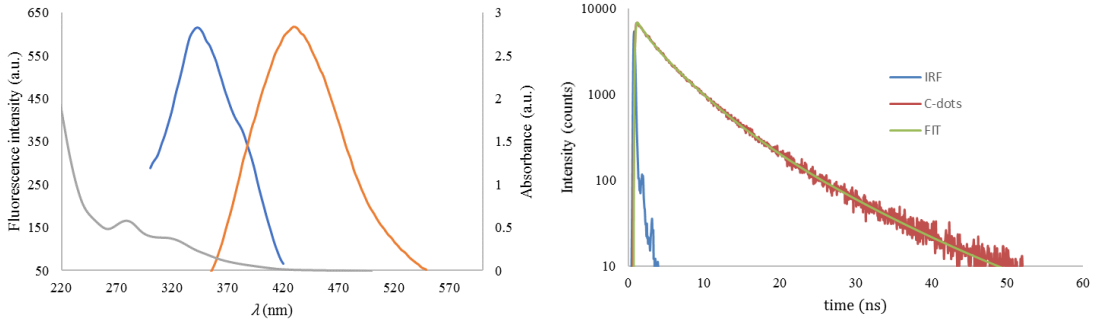
Olive oil production is quite significant for European agro-industrial economies (68% of the worldwide quota) [1]. Two-phase extraction systems are currently the most used to produce olive oil, resulting in a by-product called wet pomace, which reaches around 800 kg/ton of processed olives. The latter residue contains substantial amounts of polyphenols/phenols, polysaccharides, and proteins, making it a promising renewable raw material for the synthesis of luminescent carbon nanomaterials. Our previous work in this area has shown the potential of cork industry and olive mill waste waters to generate high added-value carbon dots (C-dots) for several applications [2,3].

Herein we report the optical properties of synthesized carbon nanomaterials obtained by hydrothermal carbonization (HTC) of pomace. Ground-state absorption, steady-state fluorescence (excitation and emission) and time-resolved fluorescence, were used to characterize the materials (Figure a). Under optimized HTC conditions, the C-dots exhibit a quantum yield around 0.2 (λ_{exc} = 340 nm) and lifetime decays of 5-6 ns (λ_{exc} = 405 nm) (Figure b). Raman spectroscopy indicates some degree of three-dimensional ordering within the structures, showing broad but well-identified G and D bands. Very interesting results were also obtained from fluorescence anisotropy measurements of C-dots dispersed in PVA.



(a) *(b)*

Figure. *(a) Ground-state absorption (gray), excitation (blue; monitored at 431 nm) and steady-state emission (orange; λ_{exc} =340 nm) spectra of an aqueous dispersion of C-dots (0.1 mg/mL); (b) Time-resolved intensity decay of the same sample (λ_{exc} = 405 nm).*

References

[1] International Olive Council, 2020/2021; https://www.internationaloliveoil.org/2020-21-crop-year-production-down-consumption-up/

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