# CARBON NANODOTS FROM OLIVE MILL WASTEWATER: A SUSTAINABLE ROUTE

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Olive oils are obtained from the fruit of the olive tree (*Olea europaea* L.) by combined mechanical and physical operations. Portugal has a significant production of olive oil (76 k tonnes/year over the last 5 years, 2010-2015) [1]. Olive oil is typically obtained by two main processes: batch press and continuous centrifugation. Depending on the particular process used, 200-1600 L of olive mill wastewater (OMWW) is produced per tonne of processed olives. Taken the lowest of these values, an estimate points to around 15 million L of OMWW may be produced each year in Portugal. The OMWW exhibits very low biodegradability parameters which pose serious issues for its treatment. Sustainable production of high-valued carbon materials from industrial low-valued and problematic wastes is particularly appealing and highly desirable.

In this communication, we show for the first time that highly luminescent carbon nanodots (CNDs) can be obtained directly from a two-stage OMWW in excellent yields following expedite and sustainable processes with minimum post-processing. The morphology, surface functionality, microanalysis and photophysical properties of the as-synthetized nanostructured materials will be presented and discussed in regard to several operation variables (viz. reaction temperature, dwell time and additives).

The as-prepared CNDs present a tunable photoluminescence (excitation-dependent) spanning over the entire visible spectra which can be modulated by synthesis. Under specific synthetic conditions, the as-synthesized CNDs are deep blue emitters ($\lambda_{em\ max} \sim 410$ nm; $\lambda_{exc} = 340$ nm) displaying a notable quantum efficiency ($\Phi_F \sim 0.4$), an extremely high photostability ($\sigma_{em\ var} = 0.008$ upon 5h of continuous irradiation at 340 nm), and a pH-responsive luminescence (pH 1-12). Such luminescent properties of CNDs, allied to their easy synthesis, carbon source affordability and excellent dispersion in aqueous solutions and polar protic and non-protic organic solvents, render them with unique capabilities to be used in several current and emerging applications in the fields of cellular imaging, chemo/biosensing, (photo)catalysis and optoelectronics.

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[1] Portuguese Olive Oil Association, 2016; http://www.casadoazeite.pt/en/; Apr 2017.