



FLUORESCENT CARBON NANODOTS FROM OLIVE OIL PRODUCTION RESIDUES: PREPARATION, CHARACTERIZATION AND ANALYTICAL APPLICATION

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ABSTRACT

We used olive oil production residues, such as olive leaves, olive cake, crushed olive stones and fine combustion particles (fine char) for the synthesis of fluorescent carbon dots (CDs) through hydrothermal processing. CDs were prepared in water, in aqueous solution of ethylenediamine and in aqueous solution of cysteamine. The hydrothermal temperature and time were investigated in the range of 150-180 °C from 3 to 48 h. The morphology of CDs was studied by transmission electron microscopy. The CDs were nearly spherical with sizes from 3-7 nm. The functional groups of the CD preparations were studied by FTIR. The presence of hydroxyl and carboxyl groups and epoxy groups on the surface offers great water solubility. The CD preparations exhibited fluorescence excitation-dependent emission. The excitation maximum was 320-340 nm. The emission spectra exhibit large Stokes shifts of 70-80 nm. The fluorescence quantum yields of CDs prepared in water, ethylenediamine and cysteamine were 2%, 6.7% and 12%, respectively. The fluorescence remained constant at various ionic strengths corresponding to 0-1 M NaCl. The effect of pH on the fluorescence of CD preparations was studied in the range of 2.5 to 12. The effect of the presence of 32 inorganic ions on the fluorescence spectra of CDs was also studied. Furthermore, studies have been carried out demonstrating that carbon nanodots can be used for the quantitative determination of Fe³⁺ and CrO₄²⁻ in the range of 5-100 μM based on the fluorescence quenching properties of these ions. In conclusion, the present study creates new prospects for the transformation of widely available and environmentally harmful materials to high added-value analytical tools.

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