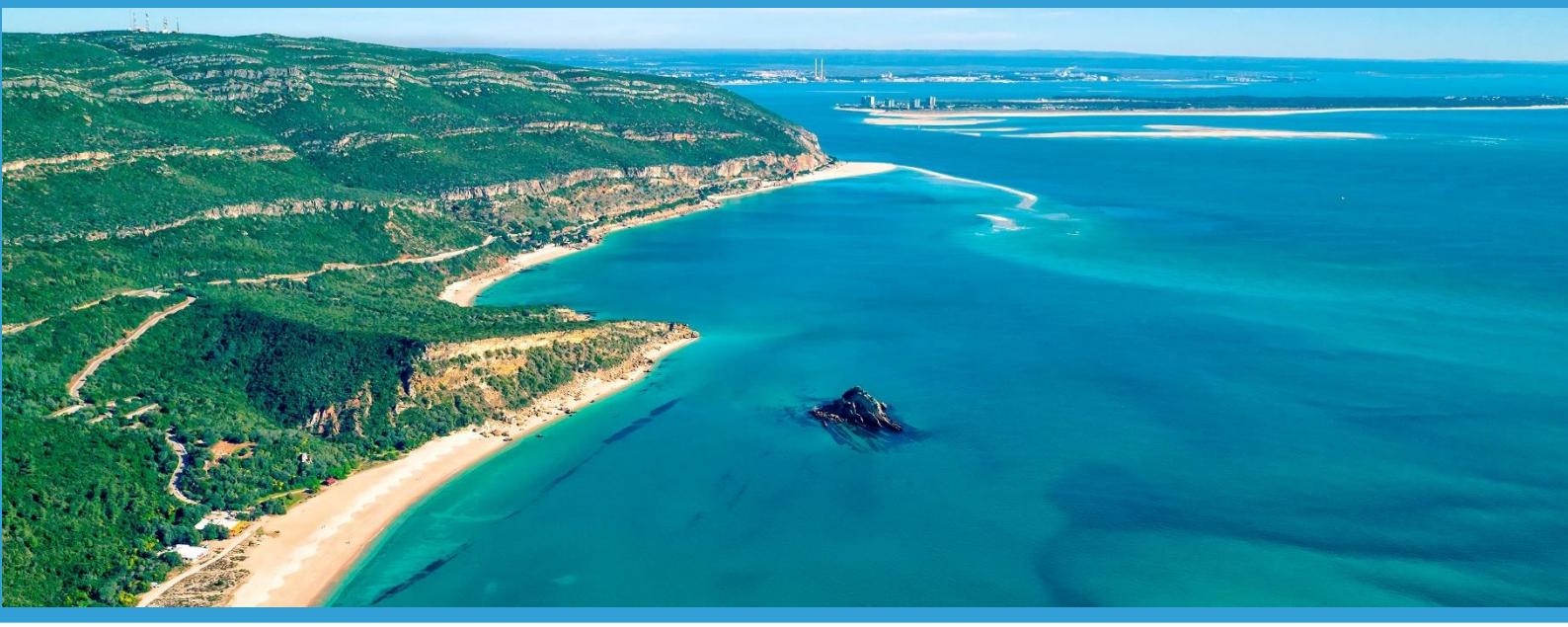
6th PYCHEM

Portuguese Young Chemists Meeting



Book of Abstracts

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Book of Abstracts of the 6th Portuguese Young Chemists Meeting

Gamma radiation induces degradation of phenolic acids

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The aim of this work was to study the degradation by gamma radiation of four phenolic acids (gallic acid, protocatechuic acid, vanillic acid and syringic acid) that are recalcitrant pollutants present in cork wastewaters [1]. The irradiations were carried out at room temperature using a Co-60 experimental equipment, under different pH (natural, 3, 7 and 10) and atmospheres (aerated, N_2O and O_2) for isolated and aqueous mixture phenolic acids' solutions. The applied absorbed doses were 5-20 kGy at a dose rate of 1.5 kGy/h. The degradation of phenolic acids was analyzed by HPLC-DAD and the identification of radiolytic products was carried out by LC-DAD-ESI/MS. The obtained results indicated that the degradation of the compounds was higher in isolated than in the mixture solutions suggesting a protective effect in the quaternary mixture solution. The N_2O saturation promoted the highest degradation rates in the mixture, at natural pH, however in aerated conditions it was achieved degradation efficiencies >50% for a treatment dose of 20 kGy. Concerning the identification of the radiolytic products two different compounds were identified (trihydroxybenzoic acid, $[M-H]^-$ at m/z 169, and methyl gallate, $[M-H]^-$ at m/z 183) as radiolytic products of the studied phenolic acids (Figure 1).

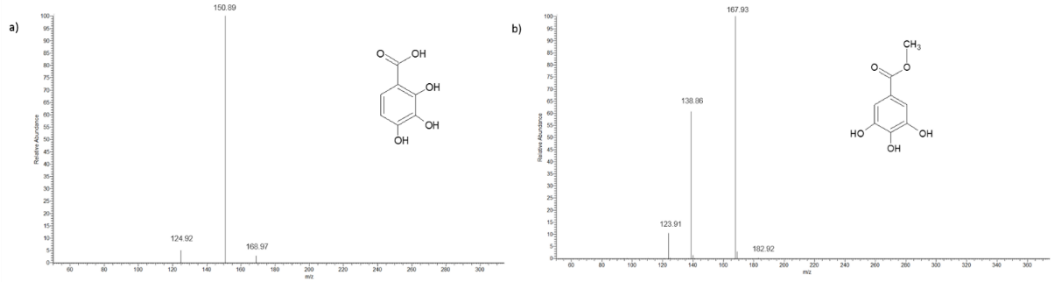

Figure 1. MS fragmentation spectra of a) 2,3,4-trihydroxybenzoic acid and b) methyl gallate.

The degradation mechanisms of the studied phenolic acids was proposed. The results highlighted that ionizing radiation could be used as clean technology for pollutants degradation using doses of 20 kGy.

References

[1] Lima, C.; Madureira, J.; Melo, R.; Carolino, M. M.; Noronha, J. P.; Margaça, F. M. A.; Cabo Verde, S., J. Adv. Oxid. Technol. 2016, 19, 73–78.

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