

Surfactant coated carbon nanotubes for the liquid-liquid extraction of phthalates and other migrants in virgin olive oils

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Phthalic acid esters, commonly called phthalates, are widely used (about 80% of these compounds) as plasticizers in the polymer industry to improve flexibility, workability and general handling properties. Since these compounds do not form stable bonds with polymer to which they are added, these contaminant substances tend to migrate from the package to the product contained on it, especially in the case of fatty and oily foodstuffs. Because of their extensive use, they are potential hazards for human health as a consequence of their endocrine disruptive effects.

This communication presents a novel application of the surfactant coated carbon nanotubes for the joint extraction of phthalates, xylene isomers and styrene from virgin olive oils. For this purpose, two carbon nanotubes, multi-walled and single-walled carbon nanotubes were evaluated, being the former which provided the better results. The target migrants were liquid-liquid extracted from the virgin olive oil samples by means of the carbon nanotubes pseudophase and the aqueous extracts were analysed by headspace-gas chromatography-mass spectrometry. Sodium chloride was added to favour analytes' release to the gaseous phase of the vial. The comparison of the chromatograms obtained with the direct analysis reveals a sensitivity enhancement with the use of the surfactant coated carbon nanotubes, especially for the phthalates, which can be ascribed to the π - π interaction between the aromatic ring and the nanotubes surface. Limits of detection were between 6-30 μgL^{-1} for 1 mL of sample. The precision of the method was better than 7.6% and the recoveries higher than 92%.

Finally, the influence of the package material and the storage conditions on the concentration of the analytes was accomplished and it was found that the concentration of phthalates increases with the time in all the packages studied while the more volatile compounds were found to decrease under the same conditions.