

Title: Study of a solid phase extraction (SPE) method for the analysis of benzophenone-based UV-filters in environmental waters by CZE.

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The public interest in pharmaceutical ingredients and personal care products entering into the environment has increased recently because the research is showing that detectable, and potentially harmful, concentrations are being achieved. Personal care products such as fragrances, lotions, cosmetics and sunscreens contain various chemicals which are being considered emerging contaminants. The main way in which personal care product components are entering into the environment is through water, especially through the domestic water that is released by sewage treatment plants.

Among the compounds used in the manufacture of this kind of products we can find the benzophenones (BPS), which work as UV radiation filters because they are able to absorb the radiation by promoting their electrons to an excited state, dissipating it as heat when the electrons are coming back to their ground state. Due to this property, benzophenones are used in products such as perfumes and soaps in order to prevent smell and color degradation by ultraviolet light, but also in plastics and packaging to block UV radiation and protect the product inside.

The aim of the present work is to study the applicability of capillary zone electrophoresis (CZE) method proposed for the analysis of eight benzophenones in environmental water samples, which are complex matrices because of their composition and salinity. To achieve this objective, a sample treatment method able to provide sample extracts with low salinity and conductivity, in order to be compatible with CZE-based methodologies, must be developed. For this reason, a study of sample treatment and extraction methods, focusing especially on solid phase extraction (SPE) has been initiated by comparing several phase extraction cartridges with different stationary phases, and by determining the breakthrough volume of the SPE cartridge selected as optimum. For this purpose, recoveries were established in several water matrices (with different salinity and with the different extraction cartridges evaluated: C18 (500 mg), Oasis

HLB (500 mg), Strata X (200 mg) and Bond Elut Plexa (200 mg), in order to select the optimum one which provide the best recoveries for the higher number of benzophenones in the variety of water samples studied.

For the recovery determination in the samples and extraction cartridges evaluated, the obtained extracts were analyzed using a CZE method previously developed in the research group. In this method, an uncoated fused-silica capillary of 50 cm total length (40 cm effective length) and with 75 μm of internal diameter was used. In addition, electrophoretic separation was carried out using a 35 mM sodium tetraborate buffer solution under counter-electrosmotic flow (EOF) conditions by applying a capillary voltage of +30 kV.

From the comparison of extraction cartridges, a hydrophilic-lipophilic balance sorbent (HLB) cartridge named Strata X (200mg) from Phenomenex was selected as optimum because recoveries higher than 85% for most of BPs, with the exception of three of them with lower recoveries (between 10% and 42 %), were obtained. However, the study carried-out showed that this was the SPE cartridge where the eight benzophenones had the best interaction. In a second part of this work, and with the aim of establishing the preconcentration capacity of the selected cartridge, the breakthrough volume was established, obtaining 500 mL as the optimum volume for sample treatment.