UNIVERSITI TEKNOLOGI MARA

PREPARATION OF ACTIVATED CARBON FROM PALM OIL FIBER ENCAPSULATED WITH BIOPOLYMER FOR DISPERSIVE MICRO-SOLID PHASE EXTRACTION COMBINE WITH LIQUID AND GAS CHROMATOGRAPHY TO DETERMINE PAHS IN TEA SAMPLES

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ABSTRACT

Tea are the most widely consumed beverages in the world and without knowing the concentration of PAHs presence in the tea can be risky since PAHs can easily enter all the organ once it is consumed. PAHs are known for its genotoxic, mutagenic and carcinogenic effects to humans. Traces amount of polycyclic aromatic hydrocarbons (PAHs) in tea beverages have made their analyses difficult, thus sample pre-concentration essential. This study investigated activated carbon (AC) prepared from palm oil empty fruit bunch (EFB) encapsulated in two different biopolymers which are Alginate-EFB-AC beads (Alg-EFB-AC beads) and Agarose-EFB-AC gels (Agr-EFB-AC gels) for the microextraction of PAHs from tea samples matrices prior to high performance liquid chromatography ultraviolet detection (HPLC/UV) and gas chromatography mass spectrometry detection (GC/MS), respectively. EFB-AC, Alg-EFB-AC beads, and Agr EFB-AC gels were successfully synthesized and characterized using Fourier transform infrared (FTIR) spectroscopy, field emission scanning electron microscopy (FESEM) and nitrogen adsorption-desorption analysis. Alg-EFB-AC beads and Agr-EFB-AC gels were utilized as sorbents in the dispersive micro-solid phase extraction (D-µ-SPE) of four PAHs which are naphthalene, fluorene, phenanthrene and pyrene. The optimized condition Alg-EFB-AC beads/D-µ-SPE method is ethyl acetate as desorption solvent, 20 minutes extraction time, 15 minutes desorption time and 50 mg of sorbent. Under the optimized condition the method provides good linearity ($r^2 \geq 0.9909$) with good limit of detection (LODs) for analytes in tea samples in the range of 0.011 to 0.047 mg/L. Whereas, the optimized condition for Agr-EFB-AC gels/D-µ-SPE is ethyl acetate as desorption solvent, 23 minutes extraction time, 11 minutes desorption time and 0.16 %w/v AC. This method also provides satisfactory linearity ($r^2 \geq 0.9915$) with good LODs (0.010-0.036 mg/L) under optimized condition. The D-µ-SPE proved a fruitful extraction technique with high relative recoveries in the range of 82.82 to 120.31% with RSD ranges from 1.08 to 7.49% and 85.15 to 120.33% with RSD ranges from 0.72 to 7.78% for Alg-EFB-AC beads and Agr-EFB-AC gels, respectively. The overall results proved that the proposed methods provide alternative approaches in sample preparation to solve analytical problems.

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TABLE OF CONTENTS