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Sol-gel electrospinning preparation of hybrid carbon silica nanofibers for extracting organophosphorus pesticides prior to analyzing them by gas chromatography-ion mobility spectrometry

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Highlights

- Carbon-silica hybrid nanofiber was used for solid-phase microextraction of pesticides.
- Two-dimensional separation structure of GC-IMS was used as the detection system.
- The method provides the acceptable sensitivity and accuracy as well as the rapid analysis.

Abstract

Carbon-silica hybrid nanofibers as high performance coatings for solid-phase microextraction fibers were used for analyzing some pesticides by using gas chromatography-corona discharge ion mobility spectrometry. To that end, the fibers were prepared by carbonizing sol-gel based on electrospun polyacrylonitrile and tetraethyl orthosilicate nanofibers as carbon and silica precursors, respectively. Different parameters affecting the electrospinning and the extraction processes including spinning distance, voltage, feeding rate, stirring rate, salt concentration, temperature and extraction time were optimized by response surface methodology. The method involved deionized water samples spiked with pesticides at different concentration levels. The calibration curves were linear in the ranges of 0.1-20 and 0.05-20 μg L^{-1} with determination coefficients (R^2) of 0.9976 and 0.9928 for malathion and chlorpyrifos, respectively. The limits of detection of 0.032 and 0.019 μg

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