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Rapid determination of 16 polycyclic aromatic hydrocarbons in $PM_{2.5}$ by microwave assisted extraction-high performance liquid chromatography

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Abstract: In this article, a method using magnetic stirring and microwave assisted extraction-high performance liquid chromatography has been developed for rapid determination of 16 polycyclic aromatic hydrocarbons (PAHs) in fine particulate matter ($PM_{2.5}$) in ambient air. PAHs in $PM_{2.5}$ captured on glass fiber filters were directly extracted only using 4 mL acetonitrile in a microwave extractor with magnetic stirring. Compared with dozens of minutes reported previously, the extraction time of this work only needs 6 min. After filtered through a hydrophobic membrane, the extract was directly injected for analysis. It also greatly shortened the duration of sample preparation. The operating procedures have been simplified, avoiding loss of analytes and systematic errors resulting from solvent replacement, concentration and nitrogen blowing and thereby ensuring a stable extraction efficiency, accurate and reliable analysis. The 16 PAHs were well separated on a ZORBAX eclipse PAH column using acetonitrile and water as mobile phases and detected by an ultraviolet detector and a fluorescence detector in tandem. Good linearity was demonstrated over the concentration range of 0.025 μg/mL to 5.000 μg/mL, with correlation coefficients being not less than 0.9998. The spiked recoveries were between 78.7% and 115.6%. The relative standard deviation ranged from 0.7% to 7.8%. The detection limits varied from 0.008 ng/m^3 to 0.075 ng/m^3. The method is rapid, environmentally friendly, accurate and sensitive with high extraction efficiency, convenient operation and strong resistance to interference. It is suitable for simultaneous determination of 16 PAHs in samples delivered in bulk.

Key words: $PM_{2.5}$; polycyclic aromatic hydrocarbons; high performance liquid chromatography; microwave assisted extraction

1. Introduction

Polycyclic aromatic hydrocarbons (PAHs) are a class of organic pollutants contain two or more benzene rings or five-membered rings structurally resembling benzene rings. They are mainly a result of incomplete combustion of such materials as coal and petrochemical fuels [1,2].