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Solid phase extraction and fractionation of total petroleum hydrocarbons in contaminated soil by GC-MSD/FID techniques

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Environmental contamination by petroleum hydrocarbons has become a global problem. Due to the complex nature of petroleum components, assessment of the impacted environments has always been based on a risk-based approach that quantifies the total petroleum hydrocarbons (TPHs), instead of measuring the individual fractions. To enhance the TPH analysis, this study examined more feasible fractionation methods for TPHs in contaminated soil using solid phase extraction (SPE) technique followed by analysis utilizing gas chromatography-mass selective detector (GC-MSD) and gas chromatography-flame ionization detector (GC-FID) systems. Present investigation showed an improvement in the separation and quantitation of a total of 31 individual aliphatic components ranging from C_{10} to C_{40} and 16 USEPA priority polycyclic aromatic hydrocarbons (PAHs) combined from three different types of soils. The tested adsorbents were silica, Florisil and silica/propyl/cyano in commercially available SPE cartridges and traditionally laboratory prepared columns. The silica was found to be the most efficient adsorbent. Parameters that influence the extraction efficiency such as elution solvent, elution volume, breakthrough volume and loading capacity were determined. The accuracy of the aliphatic components ranged from 90.0% to 118.8% with %RSD of 1.4-11.0 with the spiked levels of 1.25, 10.0, 25.0 and 35.0 mg/kg while that of the aromatic components were 61.0-99.0% (%RSD 5.1-9.6) at spiked levels of 1.0, 5.0, 7.0 and 10.0 mg/kg in soil samples. Parameters such as linearity, detection limit and precision were validated. Analysis of the data showed that the present fractionation approach allows much improved analytical measurements of TPH than existing methods in terms of several analytical aspects as examined.

Biography

Maria Vilma Faustorilla has obtained her Bachelor and Master of Science degrees in Chemistry from the University of the Philippines, Philippines. She is currently a PhD student at the University of South Australia, Australia. Her research project is on the development of an accurate measurement for petroleum hydrocarbons in soil for risk assessment. She has accumulated many years of experience in R&D, QC, QA, Clinical and manufacturing environments. She is very familiar with laboratory and manufacturing documentation and process systems, having worked in various highly regulated environments that are NATA, TGA or FDA accredited.

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