AN INITIAL EVALUATION OF THE PERFORMANCE OF A TENAX BASED PASSIVE AIR SAMPLER

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Sampling and analysis of Polycyclic Aromatic Hydrocarbons (PAH) in air have been at the forefront of scientific research regarding the control and monitoring of air pollution. Sampling for PAHs in air had been performed mostly by active sampling in the past, but recently, passive sampling has emerged as a simpler, cost efficient and an effective alternative method. This study focused on fundamentals of development and validation of a passive air sampler constructed with Glass Fiber Filters (GFF) and *Tenax* as base material.

The sampler was constructed by impregnating a 12.7 mm GFF with a commercially available sorbent known as *Tenax*. It was designed to collect gas-phase PAHs by diffusion and particle-bound PAHs by gravitational settling. The analytical detection technique for PAHs was thermal desorption gas chromatography, coupled with mass spectrometry (TD-GC/MS) and it facilitated a range of 23 target PAHs between naphthalene and dibenz[a.h]anthracene. Retention and recovery of PAHs were tested by spiking the samplers with standard reference PAH mixtures (SRM). The sampler was validated for the rate of sampling (R_S) by a five-day sampling campaign in suburban ambient air, in which the passive R_S were calculated by cross comparison with simultaneous active sampler data.

Initial testing for the sampler with the best PAH recovery involved a solid *Tenax*-impregnated sampler, a liquid *Tenax*-coated sampler and a blank GFF. By a comparison of reference-PAH recovery, the *Tenax*-impregnated sampler was concluded as the best. All 23 PAHs were quantified by the GC/MS method and the overall recovery of PAHs between naphthalene and dibenz[a.h]anthracene ranged within 67-89 %. Gas/particle partitioning of PAHs in the sampler were concluded based on literature reports. Results from the validation trail, which involved six passive and active samplers, indicated R_S as 0.11 m^3/day for two-ringed PAHs and 0.63 m^3/day for five-ringed ones. Rest of the PAHs ranged in between. Yet, a better consistency was observed for low-molecular weight PAHs. Most R_S were a one order of magnitude lower than peer-reported values. However, it was compensated by the sensitivity of the GC/MS method, which rendered the limit of detection (0.02 ng/sample) one order of magnitude higher than peer-reported levels. Furthermore, our R_S were commendable with comparison to other samplers which were, in terms of surface area, two orders of magnitude higher. A better efficiency, in the form of a higher R_S, was observed for our sampler, upon prolonged sampling periods at outdoor ambient air conditions.

The sampler performed well against both low molecular weight-PAHs and heavier particle-bound compounds. However, the field trial indicated that, the sampler design is exceptionally suited for more diffusion-driven sampling of volatile PAH species. Obtained sampling rates exhibited a potential for future use as a more quantitative sampler for both gaseous and particle-bound PAHs.