Characterizing dynamic atmosphere generation system performance for analytical method development

Introduction

Laboratory-generated environments are substantial parts of the work involved in developing and validating methods for sampling volatile organic compounds (VOCs) in workplace atmospheres. We assessed the variability of samples produced by our dynamic atmosphere generation system designed for VOC generation and sampling. The characterization of bias and variability was conducted across various atmospheres containing pure n-heptane as well as mixtures of VOCs, which were collected using coconut shell charcoal tubes. The analysis of VOCs from these charcoal tubes was evaluated to reveal the variability from multiple sources: the generation of the atmosphere, the sampling process, and the analytical procedures. This research aimed to quantify the extent of variability from these sources and to estimate the sampling variability associated with our dynamic generation system. Our findings indicated that sampling variability ranged from 2% for pure n-heptane to 12% for a component within a ten-VOC mixture. Notably, sample variability increased with lower concentration levels and in mixtures compared to single-component atmospheres. This study provides a foundational reference for future experiments focused on atmosphere sampling performance at lower concentrations and in mixed VOC environments.

The introduction above was rephrased by ChatGPT-4 (with training data up to April 2023) from the original work of: Doepke et al. (2024) Journal of Occupational and Environmental Hygiene, doi:10.1080/15459624.2024.2423749.

Methods Collection

- Atmospheres of volatile organic chemicals were produced using a dynamic-atmosphere generation-system.
- Samples were taken using coconut shell charcoal sampling media.
- Analysis of the samples was done by desorbing the charcoal in carbon disulfide, which was analyzed by gas chromatography with flame ionization detector.

Citations

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