A novel inlet for enriching concentrations of reactive organic gases in low sampling flows

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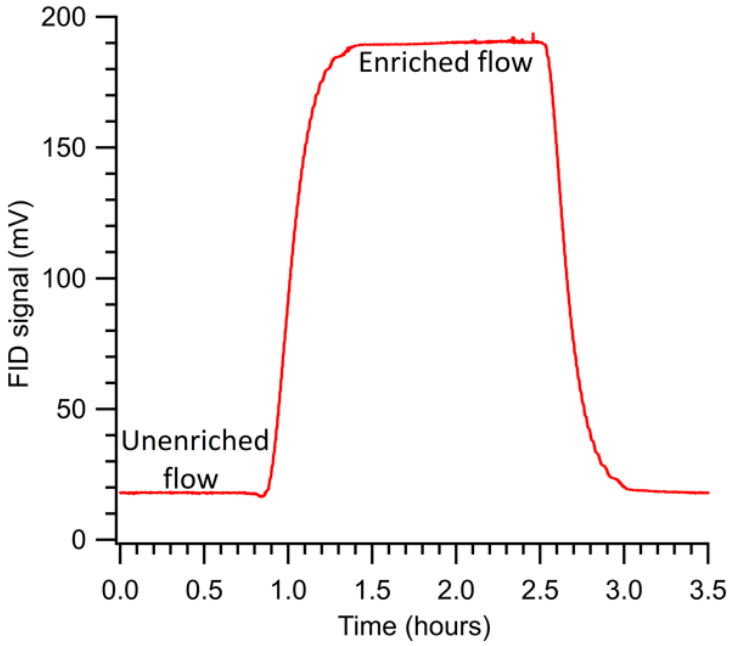
Abstract

Preconcentration of samples is often necessary to detect the low levels of volatile organic compounds present in the atmosphere. We introduce a novel inlet that uses selective permeation to continuously concentrate organic gases in small sample flows (up to several standard cubic centimeters per minute) and consequently improve the sensitivity and limits of detection of analytical instruments. We establish the dependence of enrichment on the sample flow (decreasing with increasing flow) and pressure differential across its walls (increasing with increasing pressure differential). We further show that while there is some dependence on the permeability of the target analyte, most analytes of atmospheric interest exhibit similar enrichment. Enrichments between 4640 % and 111 % were measured at flows of 0.2 to 3 sccm for major reactive atmospheric gases: isoprene (C_5H_8), monoterpenes (α-pinene, $C_{10}H_{16}$), and alkanes (C_3-C_6). The relationships between inlet design parameters, operating conditions, and inlet efficiency are modeled and validated, enabling predictable enrichment of most atmospheric gases.



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