Recoveries of 65 VOCs Over a 30 Day Period in Dry and Humid Conditions in Two Silicon-lined Canister Types

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Background

• Numerous studies have evaluated the stabilities of various volatile organic compounds (VOCs) in electropolished and Summa® passivated, stainless steel canisters [1-12].

• The general conclusion from these studies is that the majority of VOCs targeted in EPA Methods TO-14A and TO-15 are stable in electropolished and Summa® passivated, stainless steel canisters under routine ambient air analysis after storage of up to thirty days [13].

• However, it has been well documented that a minimum amount of water vapor is required in electropolished and Summa® passivated, stainless steel canisters in order for particular VOCs (e.g., polar VOCs) to be stable [14].

• It is theorized that water occupies active sites on canister walls, thereby increasing the inertness of the canister.

• Over the past decade silicon-lined canisters have been growing in popularity. However, despite their growing popularity only a few studies have evaluated the effectiveness of these canisters [11, 15-17].

• The general conclusion from these studies is that silicon-lined canisters offer better stabilities under dry conditions and for those containing compounds, which is afforded by the fewer active sites found in silicon-lined canisters.

• However, to date no study has compared the two commercially available silicon-lined canister types.

Objective

Evaluate the stabilities of 65 VOCs over a 30 day period in two different silicon-lined canister types; utilizing two extreme relative humidity (RH) conditions to draw out any differences.

Materials and Methods

• Six 6-liter SilcoCan® canisters with Parther diaphragm valves (Restek Corporation) and six 6-liter Silicote canisters with TDV™ valves (Entech Instruments, Inc.).

• All 12 canisters spiked with 5.0 ppbv of 65 component TO-15 mixture.

• Dry experiment @ 30 ppb with 0% RH nitrogen

• Humid experiment @ 30 ppb with 93% RH nitrogen

• The two extreme RH conditions were utilized so as to best elucidate any stability differences between silicon-lined canister types.

• All canisters analyzed at day 0, 1, 3, 7, 14, 21, and 30 post spiking.

• Recoveries based on an aged (3 day) 50% RH calibration curve (1.00 to 10 ppbv).

References

[1-17]