Analysis of FlexFoil Bags for Carbon Monoxide, Carbon Dioxide, and Hydrogen

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Introduction:

Air sampling bags are a convenient and accurate way of collecting airborne chemical hazards. Sampling bags are very useful when it may be necessary to collect grab samples of gases and vapors in emergency situations that require quick sampling and analysis in order for the appropriate measures to be implemented for the safety of the workers. Sample bags may also be used in the measurement of peak concentrations of contaminants from specific plant processes or work tasks or for field applications where samples will be analyzed on site. A major drawback in the use of sampling bags are the potential instability of the gas or vapor mixture in storage and sample loss through rupture or leakage in transport and handling. FlexFoil sampling bags were designed to hold lighter, fixed gases such as carbon dioxide, carbon monoxide, and hydrogen. FlexFoil bags are made from a flexible, heat-sealable barrier material with low water-vapor transmission and maximum physical strength. This study shows that FlexFoil sampling bags have good stability for carbon monoxide, carbon dioxide, and hydrogen.

Reagents and Apparatus:

Carbon monoxide, 100ppm, and carbon dioxide, 1000ppm, were purchased from Scotty Specialty Gases {Plumstedville, PA. USA}. Hydrogen was taken from our Packard hydrogen generator {Packard Instrument Company, Downers Grove, IL, USA}. Dräger tubes were used to determine the concentration of each compound (SKC catalog # CO – 800-20601, CO_2 –800-01811, H_2 – 800-01511). The Dräger tubes were obtained from SKC, Inc (Pennsylvania, PA, USA), as were the bags that were used in this study. A Dräger Accuro Bellows Pump (SKC, Inc Pennsylvania, PA, USA) was used for taking the gas samples and analyzing the bag.

Procedure:

Three liter FlexFoil sampling bags with polypropylene fittings and stainless steel fittings were used in this study. The sampling bags, three with polypropylene fittings and three with stainless steel fittings, were filled with 100ppm carbon monoxide and analyzed over a five day period with the appropriate Dräger grab sample tube. Another set of foil sampling bags were filled with 1000ppm carbon dioxide and analyzed with the Dräger tubes over the six-day period. The ability of the FlexFoil sampling bags to sample for hydrogen was conducted over a two-day period. The bags were filled with approximately 2% hydrogen and analyzed with the Dräger tubes.

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Discussion / Conclusion:

The results of this analysis show that the FlexFoil sampling bags are an accurate way to sample carbon dioxide and carbon monoxide over a two to five day period. (Table 1 and 2) The data shows that the bags held the concentration of carbon monoxide and carbon dioxide over a five-day period. Hydrogen was stable in the sampling bags for the two-day study. (Table 3)

Table 1
Stability of Carbon Dioxide in FlexFoil Bags
Concentration (ppm)

Bag	**Fitting**	**Day 0**	**Day 1**	**Day 2**	**Day 5**
Bag 1	PP	850 ppm	850 ppm	850 ppm	850 ppm
Bag 2	PP	800 ppm	800 ppm	800 ppm	800 ppm
Bag 3	PP	800 ppm	750 ppm	800 ppm	750 ppm
Bag 4	SS	750 ppm	750 ppm	800 ppm	800 ppm
Bag 5	SS	800 ppm	800 ppm	800 ppm	800 ppm
Bag 6	SS	850 ppm	850 ppm	850 ppm	600 ppm*

Table 2
Stability of Carbon Monoxide in FlexFoil Bags
Concentration (ppm)

Bag	**Fitting**	**Day 0**	**Day 1**	**Day 2**	**Day 5**
Bag 1	PP	100 ppm	100 ppm	100 ppm	100 ppm
Bag 2	PP	100 ppm	100 ppm	100 ppm	100 ppm
Bag 3	PP	100 ppm	100 ppm	100 ppm	100 ppm
Bag 4	SS	100 ppm	100 ppm	100 ppm	100 ppm
Bag 5	SS	100 ppm	100 ppm	100 ppm	100 ppm

Table 3
Stability of Hydrogen in FlexFoil Bags
Concentration (percent)

Bag	Fitting	Day 0	Day 1	Day 2
Bag 1	PP	1.60	1.60	1.60
Bag 2	PP	1.75	1.75	1.75
Bag 3	PP	1.30	1.30	1.30
Bag 4	SS	2.20	2.20	1.60*
Bag 5	SS	2.20	2.20	1.90
Bag 6	SS	1.50	1.50	1.50

- Bag leaked and sample was lost.