

## Carbon Adsorbent Kits for Sample Prep & Method Development

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Carbon based adsorbents exhibiting a broad range of adsorption strengths and surface areas are becoming increasingly popular with analytical chemists and research scientists performing thermal/solvent desorption and purge and trap applications for environmental monitoring. Newly developed methodology for solid phase extraction (SPE) using carbon adsorbents has also shown effective performance for liquid sample preparation (1,2,3). Because there are a wide variety of carbon based adsorbents and choosing the proper adsorbent to use for an application is critical to the success of an analysis, we have developed three carbon adsorbent kits along with an *Adsorbent Selection Guide* (see Related Information) to aid researchers with the development of air sampling traps or tubes. Two of the kits are composed of graphitized carbon blacks-Carbotrap™ and Carbopack™ and the third kit contains carbon molecular sieves-Carboxen™ and Carbosieve™.

The Carbotrap Kit consists of five (20/40 mesh) graphitized carbon black adsorbents while the Carbopack Kit consists of six (60/80 mesh) graphitized carbon black adsorbents with a range of surface areas and adsorption strengths. Selecting an adsorbent of the proper surface area and desorption strength

is critical to efficiently trapping and releasing the compounds of interest. Carbotrap and Carbopack are high purity graphitized carbon blacks that are exclusive to Supelco. A surface area range from 5 – 240 m<sup>2</sup>/g for the graphitized carbons included in the kits will allow a broad range of adsorbent strength options. In addition, the graphitized carbon selection of Carbopack F, C, Y, and B are nonporous adsorbents while Carbopack Z and X have some porosity and offer increased adsorption strength. Of particular interest is Carbopack X, a newly developed graphitized carbon that displays an extended analyte retention response when compared to Carbopack B. For example, the recovery of 1,3-Butadiene from Carbopack X is excellent even at large sample volumes, which in turn extends the method detection limits. Finally, all of the graphitized carbons presented in these kits are hydrophobic and are good choices when sampling in an environment where high humidity exists or when extracting organics from aqueous environments.

The Carbon Molecular Sieve Kit contains Carboxen and Carbosieve adsorbents. Both high purity spherical polymer carbons are exclusive to Supelco. Table 1 shows the physical properties of the adsorbents for each kit. Most of the Carboxen

(continued on page 4)

Table 1. Physical Characteristics of Supelco Carbon Adsorbents

	BET surface area <sup>▲</sup> , m <sup>2</sup> /g	Density, g/mL	Porosity, cc/g			Micropore Diameter, Å
			micro-	meso-	macro-	
<b>Carbotrap Kit (20/40 mesh graphitized carbon black)</b>						
Carbotrap F	5	0.69	-	-	-	-
Carbotrap C	10	0.68	-	-	-	-
Carbotrap Y	24	0.45	-	-	-	-
Carbotrap B	100	0.37	-	-	-	-
Carbotrap X	240	0.43	-	0.62	-	100
<b>Carbopack Kit (60/80 mesh graphitized carbon black)</b>						
Carbopack F	5	0.64	-	-	-	-
Carbopack C	10	0.68	-	-	-	-
Carbopack Y	24	0.42	-	-	-	-
Carbopack B	100	0.35	-	-	-	-
Carbopack Z	220	0.18	-	1.73	-	255
Carbopack X	240	0.41	-	0.62	-	100
<b>Carbon Molecular Sieve Kit</b>						
Carboxen-1016	75	0.40	-	0.34	-	-
Carboxen-569	485	0.58	0.20	0.14	0.10	5-8
Carboxen-1021 <sup>▼</sup>	600	0.62	0.30	-	-	5-8
Carboxen-1018 <sup>▼</sup>	675	0.60	0.35	-	-	6-8
Carbosieve S-III <sup>□</sup>	975	0.61	0.35	0.04	-	4-11
Carboxen-1003	1000	0.46	0.38	0.26	0.28	5-8
Carbosieve G	1160	-	0.49	0.02	-	6-15
Carboxen-1000	1200	0.48	0.44	0.16	0.25	10-12
Carboxen-1012	1500	0.50	-	0.66	-	19-21

<sup>▲</sup> Brunauer, Emmett, Teller (BET) surface area calculations

<sup>▼</sup> microporous, monoporos carbon sieve

<sup>□</sup> closed pore structure

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Figure A. Supelco Carbon Molecular Sieve Sample Kit



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(continued from page 3)

grades, with the exception of Carboxen-1018 and 1021, are multi-porous adsorbents designed specifically to efficiently retain and release only analytes with low boiling points. The Carbosieve adsorbents have a unique pore structure in combination with a high surface area and are very strong adsorbents. Both Carboxen and Carbosieve may require having a bed of weaker adsorbent, such as Carbopack, placed in front, to prevent analytes with high boiling points from reaching the pores of the molecular sieve adsorbent during sampling. In addition, within this kit we offer our newest adsorbent, Carboxen-1016, a graphitized polymer carbon. This carbon molecular sieve adsorbent demonstrates excellent performance across both a wide range of analytes and sample volumes.

The proper selection of the adsorbent components of adsorptive multi-bed traps is critical to the efficient retention and release of targeted analytes within the sample matrix. The Carbon Adsorbent Kits were developed to provide the analyst the largest practical number of adsorbent bed combinations in order to ensure nearly complete analyte coverage. The combination of the new Carbon Adsorbent Kits and Supelco's practical *Adsorption Selection Guide* allows the researcher to increase productivity by reducing the time necessary to develop and customize new multi-bed tubes for air and liquid sample preparation applications.

#### References

- Care and Use Manual for Supelco Multi-Layer Silica Gel Column and Dual-Layer Carbon Reversible Column, Supelco Data Sheet T70218 (2002).
- Y. Kemmochi, K. Tsutsumi, A. Arikawa, H. Nakazawa, J. Chromatogr. A, 977 (2002) 155-161.
- M. Concejero, L. Ramos, B. Jimenez, B. Gomara, E. Abad, J. Rivera, M.J. Gonzalez, J. Chromatogr. A, 917 (2001) 227-237.

## Carbon Adsorbent Kits

Description	Cat. No.
Carbopack Kit (60/80 mesh graphitized carbon black)	13026-U
Carbotrap Kit (20/40 mesh graphitized carbon black)	13027-U
Carbon Molecular Sieve Kit	13028-U



### Related Information

For more information on adsorbents, request *Characterization of Adsorbents for Sample Preparation Process*, T402026 (EQG) and *A Tool for Selecting an Adsorbent for Thermal Desorption Applications*, T402025 (HKZ).

### Did you know...?

The inlet liner used for a capillary split/splitless injection is critical to the proper transfer, vaporization and movement of the injected sample through the liner. New FocusLinners™ are the recommended inlet liners for improving the reproducibility of a capillary analysis. The key to the improved reproducibility provided by these liners is the proper positioning of the glass wool in the liner and due to the positioning, the ability to wipe the end of the syringe needle during the injection.



### Related Products

## Sampling and Desorption Tubes

Description	Qty.	Cat. No.
<b>Dynatherm Standard Sampling Tubes</b>		
Empty fritted tube, 6 mm O.D. x 4.5", 4 mm I.D.	3	20380-U
Empty non-fritted tubes, 6 mm O.D. x 4.5", 4 mm I.D.	5	20235-U
<b>VOST Stack Sample Tube</b>		
Empty VOST tube, 16 mm O.D. x 5" (1/4" O.D. ends)	1	21993
<b>Thermal Desorption Tubes for PerkinElmer Instruments</b>		
Empty SS tube without caps, 1/4" O.D. x 3.5", 5 mm I.D.	1	25049
Empty SS tubes with TMX brass storage caps, 1/4" O.D. x 3.5", 5 mm I.D.	50	28015-U
Empty glass tube without caps, 1/4" O.D. x 3.5", 4 mm I.D.	1	25084
Empty glass tubes with TMX brass storage caps, 1/4" O.D. x 3.5", 4 mm I.D.	50	28013-U
<b>Thermal Desorption Tubes for Tekmar®-Dohrmann Instruments</b>		
Empty SS tube, 1/4" O.D. x 7" long, 5 mm I.D.	1	20920-U
Empty SS tube, 1/2" O.D. x 7" long, 12 mm I.D.	1	20924
Empty glass tube, 1/4" O.D. x 7" long, 4 mm I.D.	1	20918
Empty glass tube, 1/2" O.D. x 3.5" long, 10 mm I.D.	1	20922
<b>Thermal Desorption Tubes for the Gerstel® ThermoDesorption System</b>		
Empty SS non-fritted tubes	1	28276-U
Empty glass fritted tubes	1	28286-U
Empty glass non-fritted tubes	1	28287-U

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