

Efficient Analyses of Permanent Gases, Light Hydrocarbons, and Light Polar Compounds by GSC

A recently developed packing for gas-solid chromatography (GSC), Carboxen™ 1000, combines analytical capabilities previously requiring two packings: Carbosieve™ S-II* and Carbosieve G. The material efficiently and reproducibly separates permanent gases, C1-C3 hydrocarbons, and permanent gas/light hydrocarbon mixtures. In addition, it can be used for analyses of more polar light compounds, such as formaldehyde and sulfur dioxide. (ChromFax: 394010)

Key Words:

- permanent gases ● light hydrocarbons
- light polar compounds ● gas-solid chromatography

Carboxen-1000, a spherical carbon molecular sieve, has an average pore diameter larger than that of the Carbosieve packings (70Å, versus 39Å) and a distribution of macropores (>500Å), mesopores (20-500Å), and micropores (<20Å) optimized to provide effective kinetics for GSC analyses. This pore size distribution, combined with a large surface area (approximately 1200m²/g, versus 1000m²/g for Carbosieve S-II), ensures the Carboxen-1000 packing will provide chromatographic analyses with retention times similar to those for the Carbosieve packings, but with greater efficiency (Table 1).

Table 1. Carboxen-1000 Columns Are More Efficient Than Carbosieve Columns

Analyte	Carboxen 1000		Carbosieve S-II			
	60/80 mesh	plates/foot	100/120 mesh	plates/foot	60/80 mesh	plates/foot
Carbon dioxide	280	12	280	12	136	11
Ethane	247	13	197	13	66	12

The high efficiency of Carboxen-1000 packing enables you to obtain effective analyses of the permanent gases and C2 hydrocarbons on a 15' (4.5m) column containing 60/80 mesh material (Figure A). If the separation of oxygen and nitrogen is unnecessary, a 5' (1.5m) column packed with 45/60 mesh material will separate the C2 hydrocarbons from oxygen/nitrogen, carbon monoxide, carbon dioxide, and methane. Use a 2' (0.6m) column containing 45/60 mesh packing to separate C1-C3 hydrocarbons that are not admixed with permanent gases (Figure B). You can also monitor trace hydrocarbons on this short column (Figure C). Analyses equivalent to those shown in Figures A and B formerly required a 10' (3.0m) column packed with Carbosieve S-II and a 5' (1.5m) column packed with Carbosieve G, respectively.

Figure A. Permanent Gases and C2 Hydrocarbons Resolved

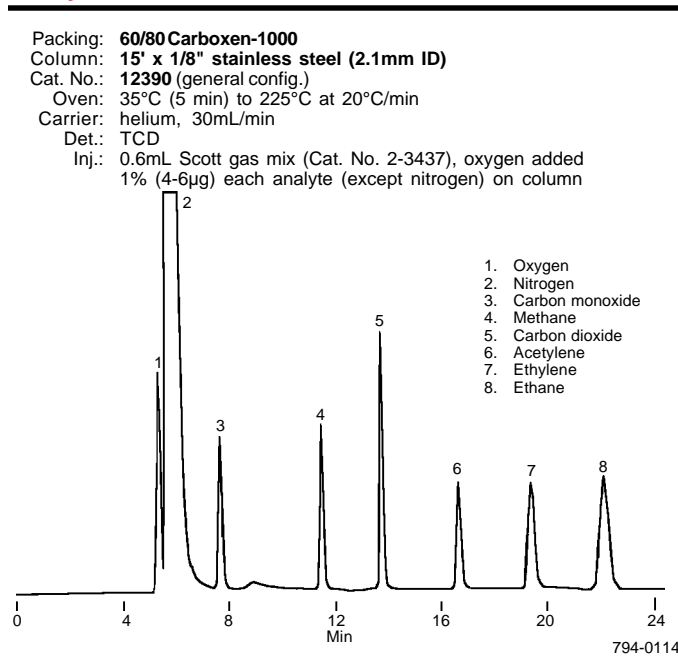


Figure B. C1 – C3 Hydrocarbons

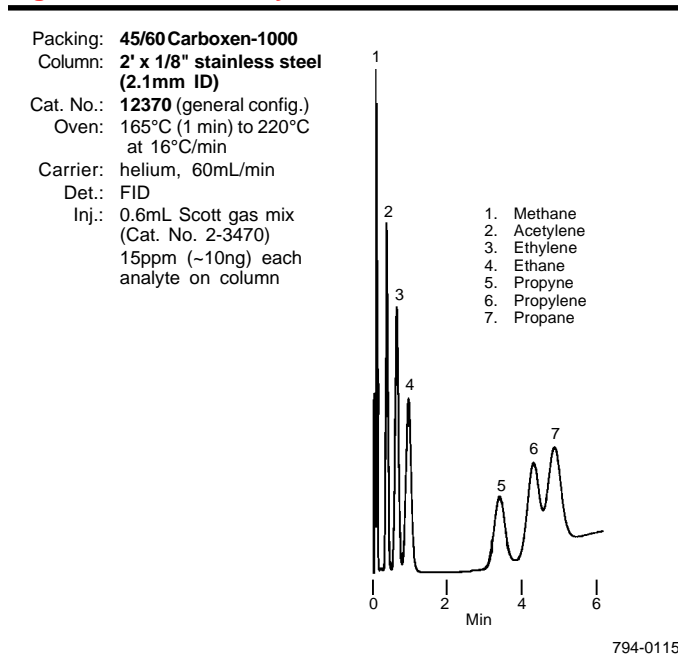
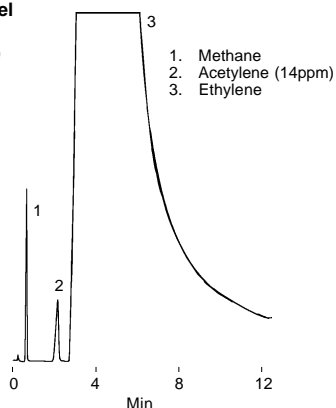


Figure C. Trace Acetylene in Ethylene

Packing: **45/60 Carboxen-1000**
 Column: **5' x 1/8" stainless steel (2.1mm ID)**
 Cat. No.: **12380** (general config.)
 Oven: 160°C
 Carrier: helium, 30mL/min
 Det.: FID
 Inj.: 0.5mL ethylene with trace impurities

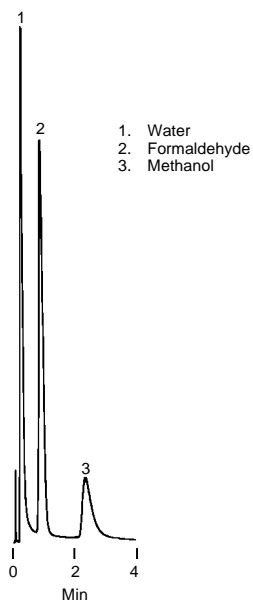


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Figure D. Polar Compounds on a Carboxen-1000 Column

Packing: **45/60 Carboxen-1000**
 Column: **2' x 1/8" stainless steel (2.1mm ID)**
 Cat. No.: **12370-U** (general config.)
 Oven: 150°C (formalin) or 190°C (SO₂)
 Carrier: helium, 30mL/min
 Det.: TCD
 Inj.: 0.2µL formalin solution
 1µL of 1000ppm SO₂ in nitrogen (~1µg SO₂ on column)

Formalin Solution



Sulfur Dioxide in Nitrogen



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The surface chemistry of Carboxen-1000 also makes the material useful for analyses of more polar compounds, such as formaldehyde in formalin solutions and sulfur dioxide in air (Figure D). These analyses were previously performed using Carbosieves S and B, materials unavailable for years.

If you are performing analyses of permanent gases, light hydrocarbons, or mixtures of these two classes of compounds, we recommend Carboxen-1000 columns for efficient, reproducible analyses and accurate peak quantification. Choose from 2' (0.6m), 5' (1.5m), and 15' (4.5m) columns, as the requirements of your analyses dictate.

Ordering Information:

Carboxen-1000 in 1/8" (2.1mm ID) stainless steel columns

Instrument	Cat. No.
2'/0.6m column, 45/60 mesh packing	
General configuration [#]	12370-U
Hewlett-Packard 5700	12371
Hewlett-Packard 5880	12372
Perkin Elmer 900	12373
Varian 3700	12374
5'/1.5m column, 45/60 mesh packing	
General configuration [#]	12380
Hewlett-Packard 5700	12381
Hewlett-Packard 5880	12382
Perkin Elmer 900	12383
Varian 3700	12384
15'/4.5m column, 60/80 mesh packing	
General configuration [#]	12390-U
Hewlett-Packard 5700	12391
Hewlett-Packard 5880	12392
Perkin Elmer 900	12393
Varian 3700	12394

#Coil diameter 6" (152.4mm), arm length 8" (203.2mm).

Contact our Technical Service Department (phone 800-359-3041 or 814-359-3041, FAX 814-359-5468) for expert answers to your questions.

Trademarks

Carbosieve — Supelco, Inc.
 Carboxen — Supelco, Inc

* German Pat. No. 1935500. Patent holder - Badische Anilin- & Soda-Fabrik Aktiengesellschaft.

Note 10

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