

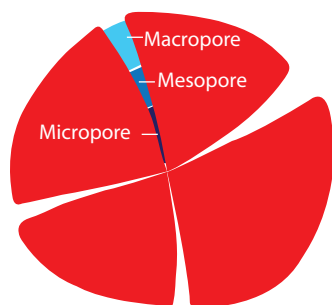
Scalable Specialty Carbon Adsorbents for Purification and Recovery Applications

William R. Betz, R&D Associate Fellow; Michael J. Keeler, R&D Senior Technician; and Michael D. Buchanan, Product Manager
mike.buchanan@sial.com

What is a “Specialty Carbon Adsorbent”?

A graphic depicting a spherical particle is shown in **Figure 1**. Controlling pore composition is very important as it determines the adsorption and desorption characteristics of the particle. There are three types of pores relevant to carbon adsorbents. A macropore has a >500 Å diameter, a mesopore has a 20 – 500 Å diameter, and a micropore has a <20 Å diameter.

Figure 1. Spherical Particle



Unlike non-specific, low-tech carbon black and activated carbon adsorbents, our specialty carbon adsorbents are highly engineered materials, many manufactured from highly pure synthetic polymers. They can be designed with:

- The shape we want, either spherical or granular
- No pores, or more/less of any pore type to serve a specific purpose
- Tapered pores (from macro to meso to micro) which increase thermodynamic and kinetic efficiency
- A through-pore or closed-pore structure, which influences microporous strength and kinetic effectiveness
- Surface pH adjustments, as low as 2.5 to as high as 10.5

Today, we make over 30 different specialty carbon adsorbents, including Carbon Molecular Sieve (CMS), Spherical Graphitized Polymer Carbon (SGPC), and Graphitized Carbon Black (GCB) adsorbents. Any modifications (activation, oxidation, graphitization, surface pH adjustment, etc.) are accomplished through physical means, not chemical means.

Scalable Adsorbents

Sixteen of our specialty carbon adsorbents are scalable, signifying we can produce large amounts ($>1,000$ kg annually) of these adsorbents in 20/40, 20/45, or 30/45 mesh. Included are some of our

Carboxen®, Graphsphere™, and Carbotrap® adsorbents. The physical characteristics for each of our scalable specialty carbon adsorbents can be found in **Table 1**.

If you are investigating a specialty carbon adsorbent for a purification or recovery application, we recommend you focus on the sixteen that are scalable to ensure we can meet your demand if you require a large quantity. Suitable uses in the petrochemical, pharmaceutical, food and beverage, environmental, and other industries include:

- **Purification applications** – An interference removal technique is used to remove an impurity or impurities from a gas or liquid stream, such as the purification of industrial gases/solvents, effluent streams, or raw materials.
- **Recovery applications** – A bind and elute technique is employed to first capture a compound or compounds from a gas or liquid, and then to recover the compound or compounds. Recovery can be through thermal or solvent desorption. An example is the recovery of a synthesized compound from a reaction mixture.

Carbon Adsorbent Sampler Kits

Choosing the right adsorbent or combination of adsorbents can be difficult: 1) must choose one or more to retain specific analyte(s), 2) may be equally important to release analyte(s) during desorption. We offer five convenient sampler kits, which allow a cost-effective way to evaluate several of our specialty carbon adsorbents. Two of these kits contain only scalable adsorbents:

- CMS/SGPC Kit II (13369-U) contains 5 g each of nine adsorbents, all in 20/45 mesh (Carboxen 563, Carboxen 564, Carboxen 569, Carboxen 572, Carboxen 1005, Carboxen 1032, Carboxen 1033, Carboxen 1034, and Graphsphere 2017)
- 20/40 GCB Kit (13027-U) contains 5 g each of five adsorbents, all in 20/40 mesh (Carbotrap B, Carbotrap C, Carbotrap F, Carbotrap X, and Carbotrap Y)

Custom Capabilities

If you do not find an adsorbent which meets your needs, let us know what the sample is (describe the gas or liquid), what you want to remove, and if you need to recover it afterwards. Our R&D group will investigate whether an existing adsorbent is appropriate or if a new adsorbent needs to be developed. To inquire about a custom specialty carbon adsorbent, please email supelco_quotes@sial.com

Once you find a stock or custom adsorbent that serves your purpose, we will work with you to either make your device for you, or to supply you loose adsorbent (in an ampul, bottle, pail, or drum). Additionally, we will continue to work with you as you implement the adsorbent into your process.

(continued on next page)

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Table 1. Physical Characteristics and Available Particle Sizes of our Scalable Specialty Carbon Adsorbents

Adsorbent	Type ^a S/G ^b		Approximate							Free Fall Density (g/mL) ^{c,d}		
			Surface Area (m ² /g)	Pore Volume (cc/g)			Pore Diameter (Å)	Micropore Diameter (Å)	pH	20/40	20/45	30/45
				Macro	Meso	Micro						
										425-850	355-850	355-600
Carboxen 1034	CMS	S	1,260	0.10	0.48	0.42	32	5-20	10.5	—	0.36**	—
Carboxen 1005	CMS	S	1,150	0.28	0.26	0.47	—	5-8	9.3	—	0.51**	—
Carboxen 572	CMS	S	1,100	0.24	0.19	0.41	—	10-12	9.5	—	0.48*	—
Carboxen 1003	CMS	S	1,000	0.28	0.26	0.38	—	5-8	9.2	—	0.51**	—
Carboxen 1032	CMS	S	820	0.10	0.38	0.29	37	4-20	3.0	—	0.51**	—
Carboxen 1030	CMS	S	740	0.11	0.13	0.26	26	5-20	4.0	—	0.53**	—
Carboxen 563	CMS	S	510	0.24	0.15	0.24	—	7-10	6.8	—	0.52*	—
Carboxen 569	CMS	S	485	0.10	0.14	0.20	—	5-8	8.6	—	0.61*	—
Carboxen 1033	CMS	S	420	0.10	0.10	0.15	33	5-17	7.0	—	0.60**	—
Carboxen 564	CMS	S	400	0.14	0.13	0.24	—	6-9	8.7	—	0.61*	—
Carbotrap X	GCB	G	240	—	0.62	—	100	—	9.5	0.44*	—	—
Carbotrap B	GCB	G	100	—	—	—	—	—	9.7	0.38*	—	—
Graphsphere 2017	SGPC	S	60	—	0.33	—	—	—	7.8	—	0.56**	0.54**
Carbotrap Y	GCB	G	24	—	—	—	—	—	9.0	0.44*	—	—
Carbotrap C	GCB	G	10	—	—	—	—	—	8.6	0.70*	—	—
Carbotrap F	GCB	G	5	—	—	—	—	—	8.7	0.70**	—	—

^a Type: CMS = Carbon Molecular Sieve.
SGPC = Spherical Graphitized Polymer Carbon.
GCB = Graphitized Carbon Black.

^b S/G: Adsorbent is spherical (S) or granular (G).

^c Particle Size: Expressed in mesh and μm units (ASTM Specifications E-11).

^d Availability: *This carbon adsorbent is available with this particle size as a stock catalog number.

**This carbon adsorbent is available with this particle size only as a custom item.

Featured Products

Description	Package Size	Cat. No.
Carbon Adsorbent Sampler Kits		
CMS/SGPC Kit II	Kit of 9 bottles	13369-U
20/40 GCB Kit	Kit of 5 bottles	13027-U
Carboxen – Carbon Molecular Sieve (CMS) Adsorbents		
20/45 Carboxen 563	10 g	10263
20/45 Carboxen 564	10 g	10264
20/45 Carboxen 564	144 ampules of 290 mg	11324-U
20/45 Carboxen 569	10 g	10269
20/45 Carboxen 569	500 g	11048-U
20/45 Carboxen 572	10 g	11072-U
Carbotrap – Graphitized Carbon Black (GCB) Adsorbents		
20/40 Carbotrap B	10 g	20287
20/40 Carbotrap B	144 ampules of 190 mg	11325-U
20/40 Carbotrap C	10 g	20309
20/40 Carbotrap C	500 g	11047-U
20/40 Carbotrap X	10 g	10435-U
20/40 Carbotrap Y	10 g	10460-U

Related Information

To learn more, request “Supelco Specialty Carbon Adsorbents” (T410081 MQR). This 12-page brochure contains details about all of our adsorbents, kits, and custom capabilities. Or, you can visit our specialty carbon adsorbent resources at sigma-aldrich.com/carbon