CAMSCO SORBENT SELECTION CHART

PHYSICAL PROPERTIES					SORBENT			APPLICATIONS AND SELECTION GUIDE		
Surface Area (m2/g)	Packing Density (g/cm3)	Maximum Temp °C	Conditioning Temp °C	Desorption Temp °C	(equivalent or replaceable)	Mesh Sizes	Volitility Range (Carbon & BP)	**Suitable Analytes**	**Features**	**Weakness/Caution**
800 (1700)	N/A	400	350	325	Anasorb CMC (CMS)	Various	C3 ~ C4 -60 ~ 80°C	Developed for sampling very volatile organic compounds, freons, volatile haloforms like methyl chloride and dichloromethane. Examples also include acetone, anaesthetic gases, propene and sulfuryl fluoride (vicane)	High surface area, used for both thermal and solvent desorption. Slightly hydrophilic. Desorption efficiencies of polar compounds are higher than with charcoal when sampling VOCs. Comparable to Carbosieve S-III, similar to Carboxen 1000/1003	Easily and irreversibly contaminated by high boilers – protect with front bed of weaker sorbent
980	N/A	350	N/A Solvent	N/A Solvent	Anasorb 747 (Beaded active carbon)	20/40	C2 ~ C5	A wide range of polar and non-polar compounds, similar to charcoals but better for polar compounds. Examples include propene oxide, dichloromethane, methanol and a variety of ketones and acrylates.	High surface area, capacity for organic vapors similar to petroleum-based and coconut shell charcoal. Normally used with solvent desorption, but does not catalyze the breakdown of ketones on its surface	Easily and irreversibly contaminated by high boilers – protect with front bed of weaker sorbent
1060	0.45	400	350	330	Carbosieve S-II	60/80 80/100	C1 ~ C2	Permanent gases (H_2, O_2, Ar, CO and CO_2) and C1 ~ C2 hydrocarbons (methane, ethane, ethylene, acetylene)	High capacity / breakthrough volume for small molecules. Some hydrophilicity, low artifacts (<0.1ng)	Easily and irreversibly contaminated by high boilers – protect with front bed of weaker sorbent
820	0.61	400	350	330	Carbosieve S-III	60/80	C2 ~ C4 -60 ~ 80°C	Permanent gases (H_2, O_2, Ar, CO and CO_2) and C2 ~ C4 hydrocarbons, chloromethane	High capacity / breakthrough volume for small molecules. Moderately hydrophilic, low artifacts (<0.1ng). Comparable to Anasorb CMC, similar to Carboxen 1000/1003	Low desorption efficiency for polar compounds. Less retentive capability than charcoal. Easily and irreversibly contaminated by high boilers. Retains more water than Carboxen 569
1160	0.49	200	190	190	Carbosieve G	Various	C1 ~ C3	Permanent gases and C2-C3 hydrocarbons	High capacity / breakthrough volume for small molecules. Low back pressure	Easily and irreversibly contaminated by high boilers – protect with front bed of weaker sorbent
510	0.55	400	350	330	Carboxen 563 (Ambersorb 340)	20/45	C3 ~ C5 50 ~ 200°C	C3 ~ C5 VOCs Similar to Carboxen 564	Low back pressure. Highly hydrophobic – humidity proof. Preferred over Ambersorb XE-340 for higher capacity / breakthrough volume in VOC analysis	Low desorption efficiency for polar compounds. May produce sulfur compounds as artifacts, typically SO_2
400	0.59	400	350	330	Carboxen 564 (Ambersorb 347)	20/45	C2 ~ C5	C2 ~ C5 VOCs Similar to Carboxen 563, but less capacity for water	Low back pressure. Highly hydrophobic – humidity proof. Preferred over Ambersorb 347 for higher capacity / breakthrough volume in VOC analysis	Less sulfur content than Carboxen 563
485	0.61	400	350	330	Carboxen 569	20/45	C2 ~ C5	Similar to Carboxen 563 and 564, but higher capacity for organic molecules and less capacity for water	Closed micropores. Hydrophobic – humidity proof. No Ambersorb equivalent	
1200	0.52	400	350	300	Carboxen 1000 (Carboxen 572) [Carbosphere] {Purosieve}	40/60 60/80 80/100 (20/45)	C2 ~ C4 -60 ~ 80°C	Permanent gases (H_2, O_2, Ar, CO and CO_2) and C2 ~ C4 hydrocarbons, i.e., vinyl chloride	Low artifacts but can produce sulfur compounds at high temp. Better desorption efficiency than S-III, significantly hydrophilic – do NOT use in humid conditions	Not as retentive as Carbosieve S-III. Easily and irreversibly contaminated by high boilers. May produce sulfur compounds as artifacts, typically SO_2. High artifacts (>10ng)
500	0.61	400	350	330	Carboxen 1001	60/80	C2 ~ C5	Similar to Caraboxen 569	Similar to Caraboxen 569 in strength and hydrophobicity	
1000	0.46	400	350	330	Carboxen 1003	40/60	C2 ~ C5	Permanent gases (H_2, O_2, Ar, CO and CO_2) and C2 ~ C5 hydrocarbons	Large surface area and hydrophobic. Similar to Carboxen 1000, Carbosieve S-III and Anasorb CMS, but retains even less water	Easily and irreversibly contaminated by high boilers – protect with front bed of weaker sorbent
1100	0.50	400	350	330	Carboxen 1012		C4 ~ C6	Larger micropore diameter than most Carboxen sorbents for slightly heavier analytes up to C6	Inert. Also used for aqueous phase adsorption of organic compounds	Easily and irreversibly contaminated by high boilers – protect with front bed of weaker sorbent
75	0.40	400	350	330	Carboxen 1016	60/80	C3 ~ C9	The weakest sorbent in the CMS family, extended range to C9	Low surface area compared to other CMS sorbents – a very rare property in CMS family	Low breakthrough volume prohibits use as the final bed in a multi-sorbent design
675 (600)	0.60 (0.62)	400	350	330	Carboxen 1018 (Carboxen 1021)		C2 ~ C3	Ethane, acetylene, acetaldehyde and other C2 ~ C3	Breath sampling tubes exhaled breath samples. Inert and hydrophobic	
600 ~ 1000	N/A	400	350	300	Molecular Sieve 5Å	Various	-60 ~ 80°C	Permanent gases, and nitrous oxide	Significantly hydrophilic – do NOT use in humid conditions	Easily and irreversibly contaminated by high boilers, high artifacts (>10ng)
600 ~ 1000	N/A	350	330	300	Molecular Sieve 13X		-60 ~ 80°C	Permanent gases, and 1,3-butadiene	Significantly hydrophilic – do NOT use in humid conditions	Easily and irreversibly contaminated by high boilers, high artifacts (>10ng)
1200	N/A	400	375	350	Unicarb (Spherocarb)	60/80	C3 ~ C8 -30 ~ 150°C	Both nonpolar and polar compounds. Especially very volatile, but spacially large molecules, e.g. SF_6	Good batch-to-batch reproducibility. Low artifacts (<0.1ng). Non-friable and inert – suitable for labile compounds. Moderately hydrophilic	Easily contaminated by high boilers. Extremely expensive
560	N/A	400	350	350	Carbograph 5TD	Various	C3 ~ C8 50 ~ 150°C	Light hydrocarbons C3 ~ C8	High thermal stability. Low artifacts (<0.1ng). Hydrophobic – humidity proof	Some activity with labile compounds. Friable
100 (100) [100 ~ 200]	0.35 (0.37)	400 (400) [400]	350 (350)	325 (325)	Carbopack B (Carbotrap B) [Anasorb GCB1] {Carbograph 1}	60/80 (20/40) [Various] {Various}	C5 ~ C12 >75°C (C5 ~ C12) [C5 ~ C12]	A wide range from medium to high volatility: Ketones, alcohols, and aldehydes (but not formaldehyde). Nonpolars within volatility range. Perfluorocarbon tracer gases. [GCB1 for both aliphatic and aromatic hydrocarbons]	High thermal stability. Low artifacts (<0.1ng). Low back pressure. Hydrophobic – humidity proof	Lower desorption efficiency than Tenax for higher molecular weight compounds when used for sampling in saturated atmospheres, i.e. during thermal stripping. Some activity with labile compounds. Friable
10 (10) [10~13]	0.68 (0.68)	400	350	325	Carbopack C (Carbotrap C) [Anasorb GCB2] {Carbograph 2}	60+ (20/40) [Various] {Various}	C8 ~ C20	In general, Carbopack C extends the capability of Carbopack B to higher molecular weight analytes. Alkyl Benzenes and large aliphatics (C8 ~ C20). Heavy organics: PCBs (polychlorobiphenols), PNAs (Polynuclear aromatics)	High thermal stability. Low artifacts (<0.1ng). Low back pressure, low surface area. Hydrophobic – humidity proof	Some activity with labile compounds. Low surface area. Friable
5 (5)	0.64 (0.69)	400	350	325	Carbopack F (Carbotrap F)	60/80 (20/40)	C9 ~ C30 Esp. > C20	In general, Carbopack F extends the capability of Carbopack B to higher molecular weight analytes. Lower surface area for trapping and efficiently releasing larger molecules, in the C9 ~ C30 range	High thermal stability. Very low surface area. Hydrophobic – humidity proof	Some activity with labile compounds. Very low surface area. Friable
240 (240)	0.41 (0.43)	400	400	400	Carbopack X (Carbotrap X)	40+ 60/80 (20/40)	C3 ~ C5 80 ~ 145°C	Light hydrocarbons: 1,3-Butadiene, benzene, toluene, and xylene	High thermal stability. Low artifacts (<0.1ng). Hydrophobic. Porous, bridges CMS's and GCB's in terms of sorbent strength	Some activity with labile compounds. Friable
24 (24)	0.42 (0.45)	400	350	325	Carbopack Y (Carbotrap Y)	60+ (20/40)	C12 ~ C20	Less volatile Hydrocarbons C12 ~ C20	High thermal stability. Bridges Carbopack C and Carbopack B in terms of sorbent strength	Friable
220	0.18	400	350	325	Carbopack Z	60/80 (20/40)	C3 ~ C9	Light hydrocarbons C3 ~ C9	High thermal stability	Friable
<5	1.68	350	350	330	Glass Beads	60/80		Semi-volatiles, solids at room temperature	Thermally stable, inert, low surface area. Acts as a filter at tube inlet, segregating higher boiling compounds from more tenacious adsorbents	Suitable only for large molecules
750	0.76	200	190	180	Silica Gel	60/80 80/100	Water, polar compounds	Low-boiling polar compounds, especially useful for separating chlorinated or sulfur compounds from matrices with hydrocarbon interferences	Within optimum range, good adsorption / desorption qualities. Either granular or beaded forms. Can be chemically modified to fit different applications	Retains water (adsorbs up to 40% of its own weight in moisture), little affinity for non-polar compounds
1070 (1200)	0.57	400	190	180	Coconut Charcoal (Anasorb CSC)	20/40 60/80	C2 ~ C5 -80 ~ 50°C	Wide variety of non-polar compounds	High capacity / breakthrough volume for low boilers. Greater retention capability (lower desorption efficiency) than Carbosieve SIII or Anasorb CMS	Higher capacity than Carbosieve SIII or Anasorb CMS. Tendency to retain water. May catalyze the breakdown of ketones
1050	0.50	400	190	180	Petroleum (JXC) Charcoal	20/40 (20/40)	C2 ~ C5 -80 ~ 50°C	Charcoal derived from residue of petroleum products	Same as above	Same as above
330	1.02	190	N/A Solvent	N/A Solvent	Amberlite XAD-2 (Supelpak-2)	20/60	Specific	Polyaromatic hydrocarbons, chlorinated pesticides, organothiophosphates. Used to remove hydrophobic compounds up to 20,000 MW	Styrene/divinylbenzene copolymer. Moderate surface area; hydrophobic (dipole moment 0.3). Normally used with solvent desorption	Low temperature limit
725	1.02	150	N/A Solvent	N/A Solvent	Amberlite XAD-4	20/60	Specific	Used to remove small hydrophobic compounds and surfactants; widely used to remove chlorinated organics, organophosphorus pesticides, phenols, etc.	Styrene/divinylbenzene copolymer. Same as above, but larger surface area than XAD-2. Similarities to Anasorb 727 and Chromosorb 106	Low temperature limit
700 ~ 800	N/A	250	250	225	Anasorb 727	20/40	C5 ~ C12 50 ~ 200°C	Developed for sampling reactive compounds thanks to its unreactiveness, but capable of a wide range of compounds similar to Chromosorb 106	High surface area, highly inert. Extremely hydrophobic, all-purpose sorbent similar to XAD-4 and Chromosorb 106, thermal or solvent desorption	Low temperature limit. Special order item, limited mesh sizes available
350	0.29	250	250	225	Chromosorb 102	Various	C5 ~ C12 50 ~ 200°C	Wide range of VOCs, oxygenated compounds, haloforms and chlorine-containing pesticides that has a BP >40°C (less volatile than methylene chloride). Some functional similarities to Amberlite XAD-2	Styrene/ Divinylbenzene (DVB) copolymer. Hydrophobic, inert. Some background at high temp (> 200°C). Note: The polarity of sorbents: Chromosorb 106 < Porapak Q < Chromosorb 102 < Porapak R = Chromosorb 105 < Porapak N < Chromosorb 101 < Porapak P < Chromosorb 103 < Chromosorb 104	Low temperature limit. High artifacts (10ng)
700 ~ 800	0.28	250	250	225	Chromosorb 106	Various	C5 ~ C12 50 ~ 200°C	Low-boiling hydrocarbons, benzene, labile compounds, volatile oxygenated compounds. Functionally similar to Anasorb 727, more mesh sizes	Styrene/ DVB copolymer. Hydrophobic, inert. The least polar polymer in the Chromosorb family. Some functional similarities to Anasorb 727 and XAD-4	Low temperature limit. High artifacts (10ng), batch-to-batch variations
400 ~ 500	0.30	250	225	225	Chromosorb 107	Various	Up to 150°C	Vinyl acetate, formaldehyde from water and acetylene from lower hydrocarbons. Sulfur compounds. Not recommended for glycols and amines	Cross-linked acrylic ester polymer. Hydrophobic and polar. Note: The polarity of Chromosorb 107/108 increases with their exposure to high temperature (~ 200°C, for example)	Low temperature limit
100 ~ 200	0.30	250	225	225	Chromosorb 108 (Anasorb 708)	Various	Up to 150°C	Polar small molecules such as alcohols, water, aldehydes and glycols	Cross-linked acrylic. Hydrophobic and polar. See the note above	Low temperature limit
526	0.36	165	165	150	HayeSep A	Various	C0 ~ C2	Hydrogen, oxygen, argon, carbon oxides, nitric oxide, C2, hydrogen sulphide, and water	DVB polymer. Polarity 7/10, hydrophilic. Permanent C0 gases at ambient temp; C2, hydrogen sulphide and water at higher temperature	Low temperature limit
608	0.33	190	190	180	HayeSep B	Various	C1 ~ C2	C1 and C2 amines, trace levels of ammonia and water	DVB and polyethyleneimine (PEI) copolymer. Polarity 8/10. Highly hydrophilic	Low temperature limit
442 (650)	0.34	250 (250)	250	225	HayeSep C (Chromosorb105)	Various	NOx, COx and SOx	Polar hydrocarbons such as hydrogen cyanide, ammonia, hydrogen sulphide and water	DVB and acrylonitrile (ACN) copolymer, Polarity 6/10, hydrophilic. Similar separation characteristics to Chromosorb 104	Low temperature limit
795	0.33	290	190	180	HayeSep D	Various	Up to 160°C	Low molecular weight compounds, esp. acetylene, halogen, and sulfur groups. CO and CO_2 analysis	DVB polymer. Polarity 1/10, highly hydrophobic. Backup for Tenax where carbon based adsorbents are unsuitable. Retains low boiling compounds that breakthrough Tenax, esp. in saturated atmosphere	Low temperature limit. Moderate artifact level at upper temperature limit. High pressure drop
405 (300)	0.36 (0.38)	165 (190)	165 (180)	150 (160)	HayeSep N (Porapak N)	Various	C5 ~ C8 50 ~ 150°C	Volatile nitriles, e.g. acrylonitrile, acetonitrile, propionitrile. Pyridine, volatile alcohols, ethanol, methyl ethyl ketone	DVB and ethylene glycolmethacrylat (EGDM) copolymer. Polarity 9/10, highly hydrophilic. Porapak polymers are in order of increasing polarity as types P, PS, Q, QS, R, S, N, and T	Low temperature limit. High artifacts ~10ng)
165 (150)	0.42 (0.27)	250 (250)	250 (250)	225 (225)	HayeSep P (Porapak P / PS)	Various	Up to 200°C	Esters, ethers, ketones, alcohols, Hydrocarbons, fatty acids, aldehydes and glycols. Not recommended for amines and anilines	DVB/Styrene copolymer. Polarity 3/10. Porapak polymers are in order of increasing polarity as types P, PS, Q, QS, R, S, N, and T	Low temperature limit
582 (550)	0.35 (0.34)	275 (250)	275 (250)	250 (225)	HayeSep Q (Porapak Q / QS)	Various	C5 ~ C12 50 ~ 200°C	Some similarities to Chromosorb 106. Not for amines and anilines, not for nitric oxides	DVB polymer. Polarity 2/10, hydrophobic. Porapak polymers are in order of increasing polarity as types P, PS, Q, QS, R, S, N, and T	Low temperature limit. High artifacts, nitrated by nitrogen oxide gases
344 (525)	0.32 (0.30)	250 (250)	250 (250)	225 (225)	HayeSep R (Porapak R)	Various	Up to 200°C	Match the polarity of the analyte to the polarity of the sorbent, while covering the boiling temperature. Esters, ethers, nitriles and nitro compounds. Not recommended for glycols and amines	DVB/N-vinyl2-pyrollidone (NV2P) copolymer. Polarity 5/10, both hydrophobic and hydrophilic. Porapak polymers are in order of increasing polarity as types P, PS, Q, QS, R, S, N, and T	Low temperature limit
583 (375)	0.33 (0.35)	250 (250)	250 (250)	225 (225)	HayeSep S (Porapak S)	Various	Up to 200°C	Match the polarity of the analyte to the polarity of the sorbent, while covering the boiling temperature (Amines, amides, alcohols, aldehydes, dydrazines and ketones, Not for acids, glycols and nitriles)	DVB/4-vinyl-pyridine (4VP) copolymer. Polarity 4/10, both hydrophobic and hydrophilic. Porapak polymers are in order of increasing polarity as types P, PS, Q, QS, R, S, N, and T	Low temperature limit. Reacts with nitroalkanes
250 (300)	0.38 (0.43)	165 (190)	165 (180)	150 (160)	HayeSep T (Porapak T)	Various	Up to 150°C	Match the polarity of the analyte to the polarity of the sorbent, while covering the boiling temperature	EGDM polymer. Polarity 10/10, highly hydrophilic. Porapak polymers are in order of increasing polarity as types P, PS, Q, QS, R, S, N, and T	Low temperature limit
35	0.28	350	320	300	Tenax TA	20/35 60/80	C6 ~ C26 100 ~ 400°C	Aromatics (except benzene), nonpolars (BP>150°C), semi-volatile polars (BP>150°C). Note: Tenax TA has replaced Tenax GC for lower background signals	Poly (2,6-diphenyl-p-phenylenoxide) polymer. Low surface area, within optimum range, will readily / efficiently release what it adsorbs and can be easily cleaned to a very low background. Inert and does not react with labile compounds. Low inherent artifacts (<1ng). Low affinity for water, hydrophobic	Low breakthrough volume. May form some artifacts when heated, reported sources are: CO_2 ,benzene, toluene, benzaldehyde, acetophe
24	0.41	350	320	300	Tenax GR	20/35 60/80	C7 ~ C30 100 ~ 450°C	Alkyl benzenes, PAH's (polycyclic aromatic hydrocarbons), PCB's (polychlorobiphenols)	Low surface area. Lower affinity for water than Tenax-TA. Chemical composition: 30% graphite carbon & 70% Tenax TA	Low breakthrough volume

CARBON MOLECULAR SIEVES (CMS)

SPECIALTY MATERIALS

GRAPHITIZED CARBON BLACK (GCB)

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