

Synthetic Adsorbents

DIAION SEPABEADS Series

Synthetic adsorbents are a series of products based on ion-exchange resin manufacturing technology, and are designed for the uses as solid extractant. Synthetic adsorbents have large surface area and fine pore structures inside the particle like activated carbon. For this porous characteristic, they can effectively adsorb organic compounds from aqueous solutions. Extraction processes with synthetic adsorbents enables reducing solvent amount and safer operations compared with conventional solvent extraction techniques.

A synthetic adsorbent is spherical particle, and inside it, there exist effective fine pore structures suitable for the diffusion of solutes

Smaller solutes can penetrate into the particle by diffusing through the pores, when a solution is allowed to contact with adsorbent particles.

On the contrary, molecules that are larger than pore size cannot penetrate into the inside of particle. Consequently, such molecules are not adsorbed on synthetic adsorbents (this phenomenon is so-called molecular sieving effect).

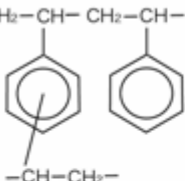
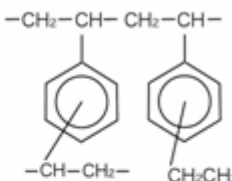
There are three types of chemical structures for synthetic adsorbents; aromatic, modified aromatic and methacrylic series.

The chemical structure dominates the degree of hydrophobicity of synthetic adsorbents. Hydrophobicity of adsorbent is important in selecting a suitable type of adsorbent according to the chemical nature of target compounds.

Aromatic	Aromatic type adsorbents are the standard grade and are based on crosslinked polystyrenic matrix. They are widely used in different industrial fields; extraction of antibiotic intermediates from fermentation broth, separation of peptides, or food additives, debittering of citrus juice etc. DIAION™ HP20 HP21 / SEPABEADS™ SP825L SP850 SP70 SP700
Modified Aromatic	Modified aromatic type is based on brominated aromatic matrix which gives enhanced hydrophobicity. This type adsorbent is suitable for adsorption of organic substances of very low concentration or of highly hydrophilic substances. SEPABEADS™ SP207
Methacrylic	Methacrylic type is based on methacrylic ester copolymer, and has relatively hydrophilic nature. This type of adsorbent is suitable for adsorption of polyphenols and surfactants. DIAION™ HP2MG

Standard synthetic adsorbents have ca 0.5 mm mean particle diameter. This size is designed for most industrial scale processes.

Product	Chemical structure	Properties	Usage	Others
DIAION™ HP20	Aromatic	surface area ca. 600 m ² /g pore radius 200-300 Å	widely used for adsorption of organic compounds and natural products molecular weight less than several tens of thousand	operated in mild adsorption/desorption conditions suitable for separation of non- porous, moderately porous substances
DIAION™ HP21		surface area -600 m ² /g pore radius 100-120 Å	molecules less than several thousands	
SEPABEADS™ SP825		surface area ca 900 m ² /g pore radius 50-60 Å	molecules less than thousand, high uptake capacity,	similar polarity to HP20 and HP21 especially for molecules less than several hundred, eliminate larger molecules
SEPABEADS™ SP850		surface area ca 900 m ² /g pore radius 30-50 Å	molecules less than several hundred, high uptake capacity	
DIAION™ HP2MG	Methacrylic	surface area ca 600 m ² /g pore radius 200-300 Å	hydrophilic, suitable for adsorption of moderate porous and slightly porous substances molecules less than ten thousand	effective for polyphenols and a certain surfactants, which are not treated with aromatic adsorbents

Product	DIAION™ HP20	DIAION™ HP21	SEPABEADS™ SP850	SEPABEADS™ SP825L	SEPABEADS™ SP700
Chemical Struture					
Apparent Density (g/L-R)	680	685	695	685	685
Moisture Content (%)	55 ~ 65	45 ~ 55	46 ~ 52	52 ~ 62	60 ~ 70
Particle Size Distribution > 250µm	90 min			95 min	
Effective Size (mm)	0.25 min				
Uniformity Coefficient	1.6 max				
Specific Gravity	1.01				
Maximu Operating Temperature (°C)	130 max				
Prosimetric Characteristics					
Specific Pore Volume(mL/g)	1.3	1.3	1.1	1.4	2.1
Specific Surface Area(m²/g)	590	640	930	930	1200
Pore Radius(Å)	290	110	45	70	90
Cephalosprin C Adsorption (g/L-R)	38	48	85	76	76
Applications	Polypeptide and proteins refining, Natural extracts refining, e.g. polyphenols, Preparation of fermentation, Chromatographic separation		Pharmaceuticals refining, e.g. cephalosporin C, Polypeptide and proteins refining, Natural extracts refining, e.g. polyphenols, Preparation of fermentation, Chromatographic separation		

SEPABEADS™ SP207 is a modified polystyrenic adsorbent. The matrix is strongly hydrophobic since the aromatic rings are chemically brominated.

The specific gravity is as large as 1.2 and therefore, this resin can be used in batchwise or upflow operations.

The matrix of the resin is more hydrophobic than the other adsorbents, and it can adsorb relatively hydrophilic compounds

SEPABEADS™ SP70 is a copolymer of highly pure divinylbenzene, which is compatible with the FDA requirements for secondary direct food additive (CFR173.65).

This adsorbent has medium size pore and is suitable for the adsorption of small natural compounds like naringin, limonin, hesperidin, etc.

DIAION™ HP2MG has polymethacrylic structure and show less hydrophobic nature than polystyrenic adsorbents.

Product	SEPABEADS™ SP207	SEPABEADS™ SP70	DIAION™ HP2MG
Chemical Structure			
Apparent Density (g/L-R)	780	680	730
Moisture Content (%)	43~53	55~65	55~65
Particle Size Distribution > 250µm	90 min	90 min	90 min (> 300µm)
Effective Size (mm)	0.25 min	0.25 min	0.30 min
Uniformity Coefficient	1.6 max	1.6 max	1.6 max
Specific Gravity	1.18	1.01	1.09
Maximum Operating Temperature (°C)	130	130	-
Prosimetric Characteristics Specific Pore Volume (mL/g) Specific Surface Area (m ² /g) Pore Radius(Å)	1.1 590 120	1.6 870 71	1.3 570 240
Cephalosprin C Adsorption (g/L-R)	118	60	-
Applications	Separation of amino acids Protein removal Purification of natural products Extraction of fermentation products	Debittering of citrous juice	Extraction of natural products Chromatographic separation Purification of proteins