ProductInformation

MOLECULAR SIEVES
Storage Temperature RT°C

Product Number	Pore size	Particle Size
Z3125		<10 µm powder
M1885	3Å	<10 µm powder
M9882		1/16" pellet
M2010		1/8" pellet
M6016		8-12 mesh bead
M6141		4-8 mesh bead
M2135	4Å	<10 µm powder
M2760		14-30 mesh powder
M0133		1/16" pellet
M2260		1/8" pellet
M1760		8-12 mesh bead
M2635		8-12 mesh bead, 15% indicating
20,859-0		4-8 mesh bead
M2385	5Å	<10 µm powder
M0258		1/16" pellet
M1510		1/16" pellet, acid-resistant
M2510		1/8" pellet
M2885		1/8" pellet, acid-resistant
20,862-0		8-12 mesh bead
20,861-2		4-8 mesh bead
M3010	10Å	<10 µm powder
M3135		1/16" pellet
M3260		1/8" pellet
M3385		8-12 mesh bead
20,863-9		4-8 mesh bead

Synonyms: Zeolites, Abscents 3000; Agrolithe15/25; Aid Plus OCMA; Aluminosilicates; Bactekiller BM 101A;

Product Description
Molecular Sieves are crystalline, three-dimensional molecules made up of silicon and aluminum atoms [1,2]. The extensive networks that make up molecular sieves contain surface pores and channels which selectively absorb only molecules of a certain size and shape. Positive ions, most commonly sodium, calcium, or potassium are added in order to balance the molecule. The specific cation chosen influences the pore diameter and therefore the adsorptive properties of the molecular sieve.

There are four basic grades of molecular sieves. These grades differ from one another due to their chemical composition and pore size.

Type 3A is the potassium form of the compound. It will adsorb those molecules that have a critical diameter of less than three angstroms. For example: WATER, Helium, Hydrogen, and Carbon Monoxide.

Composition:
0.6 K_2O : 4.0 Na_2O : 1 Al_2O_3 : 2.0 ± 0.1 SiO_2 : x H_2O

Type 4A is the sodium form of molecular sieves. It will absorb those molecules having a critical diameter of less than four angstroms. For example: Arzan and Ammonia. And those of 3Å.
Composition:
1 Na_2O : 1 Al_2O_3 : 2.0 ± 0.1 SiO_2 : x H_2O

Type 5A is the calcium form of molecular sieves. It will absorb those molecules having a critical diameter of less than 5 angstroms. For example: Methanol, Ethane, and Propane, as well as species adsorbed by 3Å and 4Å resins.
Composition:
0.8 K_2O : 0.2 Na_2O : 1 Al_2O_3 : 2.0 ± 0.1 SiO_2 : x H_2O

Type 13X is a sodium modified molecular sieve, with a pore diameter of ten angstroms. It will absorb those molecules with a critical diameter of less than 10 angstroms. For example: Chloroform, Carbon Tetrachloride, and Benzene.
Composition:
1 Na_2O : 1 Al_2O_3 : 2.8 ± 0.2 SiO_2 : x H_2O

Molecular sieves are suitable for drying, purifying, and separating a wide variety of compounds, such as inorganic gases, hydrocarbons, halogenated hydrocarbons, alcohols, esters, ethers, amines, and ketones[4]. They are being used to adsorb, and temporarily isolate molecules. When loaded on a molecular sieve. A chemical's toxicity can be reduced, its vapor pressure lowered, its corrosiveness eliminated. The chemical adsorbed is trapped within the molecular sieve until it is released by raising the temperature or by displacement by some other more strongly adsorbed material, such as water.

Storage/Stability
If the product is stored at room temperature, it is stable for at least five years[3].

Procedure
Choosing a Molecular Sieve:
1. The preferential adsorption of one molecule over another depends upon pore diameter and mesh size.
2. The dynamic capacity of the silica gel for adsorbing a particular compound is governed by the internal surface area; the greater the surface area, the greater the dynamic capacity.
3. Rate of adsorption and sharpness of resolution are dependent chiefly on particle size and column packing; a fine particle size gives optimum sharpness of resolution.
4. Liquids are most readily adsorbed from solvents in which they are least soluble; a good solvent makes a good desorbing agent.
5. Highly polar liquids are readily adsorbed. Compounds having hydroxyl groups, or containing oxygen are strongly adsorbed.
6. For similar compounds, the higher the molecular weight the higher the selectivity.
7. For hydrocarbons of similar molecular weight, adsorptivity increases with the number of double bonds.

Regeneration or Activation:
A saturated molecular sieve can be restored to its original capacity by regeneration, the principle of which involves changing the conditions surrounding the adsorbent to correspond to a very low equilibrium capacity. In general, the greater the difference between the equilibrium capacities of adsorption and regeneration, the more rapid and complete the regeneration.

The sieve may be regenerated in one of four ways:
1. Thermal reactivation –The maximum regeneration temperature for Silica is ≈300°C.
2. Pressure reactivation
3. Passing an appropriate fluid through the gel bed at normal temperature and pressure.
4. Displacement of adsorbates by passing a high concentration of molecules in a fluid through the bed.

General References

1. Per supplier data sheet
2. The Merck Index, Twelfth Edition Merck & Co. (1996).
3. Sigma Quality Control
4. Taylor G.A *J. Chem. Soc.*, Perkin Trans.1 3132, (1981).
5. McKillop A. and Young D.W., *Synthesis, 481 (1980)*
6. Kovalakova M*, et al. Nucl Magn Reson.* Dec;9(2-4):107-13.(1997)

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