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INTRODUCTION TO MOLECULAR SIEVES

Highly Effective Moisture Scavengers for Urethane and Aspartic Systems

THERE'S ALWAYS MORE TO SEE FROM PFLAUMER

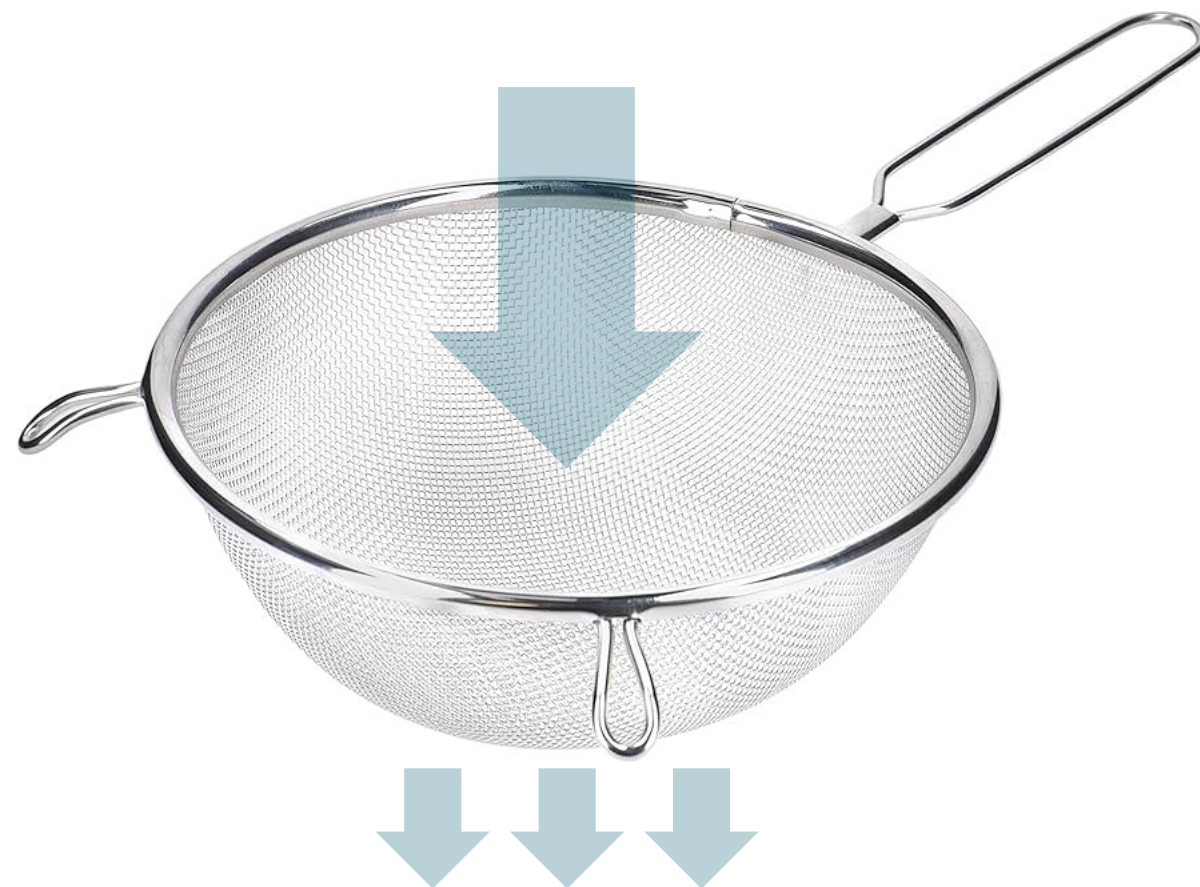


INTRODUCTION TO MOLECULAR SIEVES



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A sieve can be thought of as a filtering device.



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In the world of chemicals, sieving is more than just filtering, it also includes separating.



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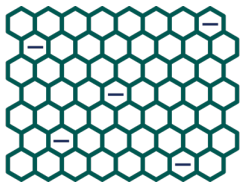


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Another name for Molecular Sieves is **Zeolites**.



Zeolite is a natural mineral created by a reaction between volcanic ash that fell into an alkaline water source during a volcanic eruption.



This combination was put under pressure and resulted in a mineral with porous three-dimensional honeycomb framework and a net negative charge.



The finished product works both like a sponge and a magnet – soaking up microscopic particles and trapping them inside.



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Uses for zeolites you never knew about.

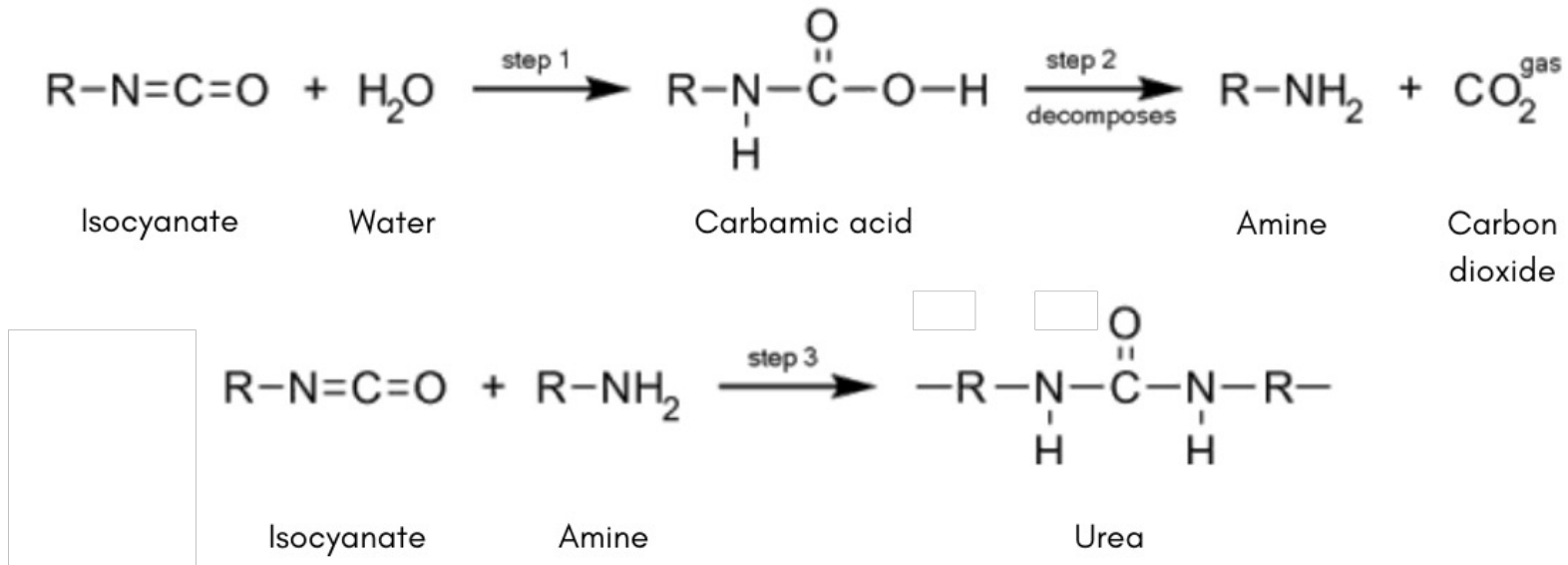
APPLICATION	ROLE OF THE MOLECULAR SIZE (ZEOLITE)
Oxygen Concentrators for Respiratory Patient	<ul style="list-style-type: none">• Adsorption of nitrogen from air to obtain oxygen purity up to 95%.
Air Brakes	<ul style="list-style-type: none">• Dehydration of compressed air on brake systems of trucks, buses and trains.• Reduction of dew point of air in the brake reservoir below ambient temperature to prevent freeze up and corrosion.
Insulated Glass	<ul style="list-style-type: none">• Removal of initial trapped moisture inside dual pane windows and moisture that permeates during the life of the unit to prevent fogging.• Removal of vapors from organic sealing materials, paint and cleaning solvents introduced during window manufacturing.
Radioactive Cleanup	<ul style="list-style-type: none">• Removal of radioactive nuclides by ion exchange.
Refrigeration and Air-conditioning	<ul style="list-style-type: none">• Dehydration to prevent freeze up and corrosion.• Dehydration to protect system materials from adverse chemical reactions.
Deodorization	<ul style="list-style-type: none">• Removal of odor.
Package Dehydrants	<ul style="list-style-type: none">• Small desiccant packets or tablets to adsorb moisture from damaging packaged contents.
Natural Gas	<ul style="list-style-type: none">• Dehydration along various processes of natural gas recovery and distribution.• Removal of CO₂.• Desulfurization of feed streams.• Removal of mercury.
Petroleum Refining	<ul style="list-style-type: none">• Dehydration of alkylation feed.• Purification of feedstocks.• Removal of water, HCl, H₂S, oxygenates, mercury and nitriles.• Dehydration of ethanol.

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The need for moisture adsorption in urethane and aspartic coatings.



Isocyanates have an affinity to moisture and produce CO₂ gas.
Air entrapment in coatings is not desirable.

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In addition to the roughly forty naturally occurring zeolites, there are **more than 250 unique** zeolite frameworks that have been identified.



Obviously, not all zeolites are created equally.

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Quality is in the selection.

Due to their microporous structure, zeolites can 'sieve' molecules, as well as selectively separate certain substances. Zeolite structures selectively adsorb water molecules.



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Pflaumer Molecular Sieve Paste offerings utilize highly selective zeolites engineered for optimal moisture adsorption and suspension in liquid carriers.



Zeolite Beads



Zeolite Powder

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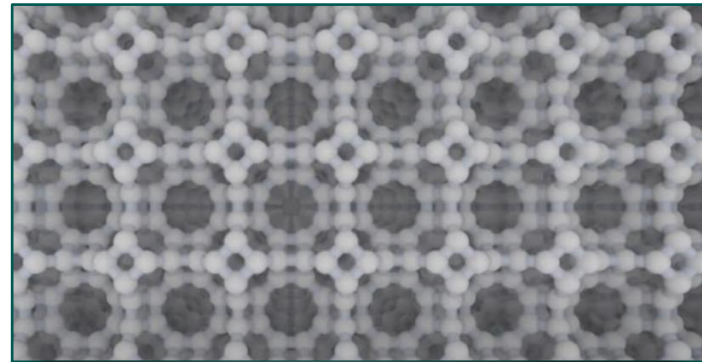


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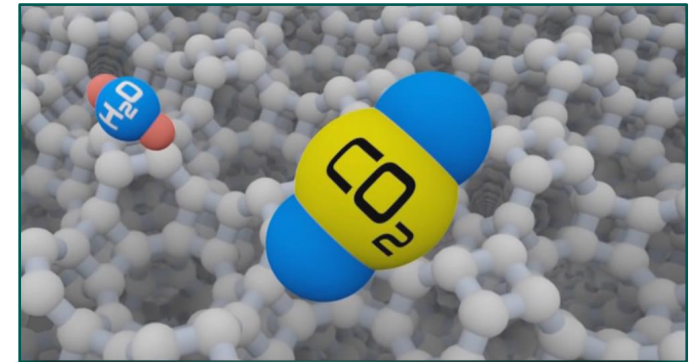
Pore size opening of zeolite structure selectively adsorbs water molecules.



Microscopic



Molecular Lattice Input Window



Input window size dictates the types of molecules that are 'trapped'

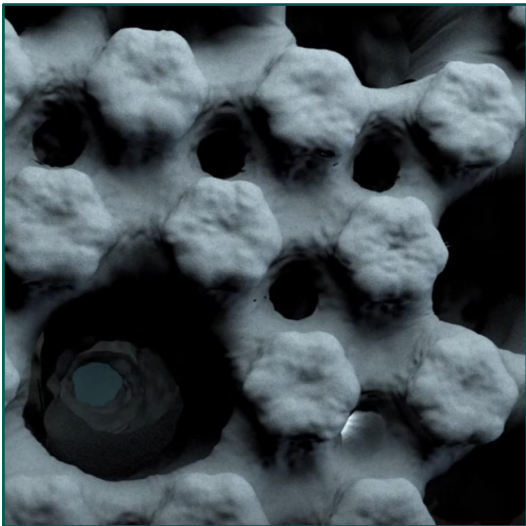
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Selectivity of molecules adsorbed is based on zeolite pore opening size.

Pflaumer Molecular Sieve Paste offerings use 0.300 nm openings.



MOLECULE	APPROXIMATE DIAMETER (Nanometer)
Water	0.265
Carbon Dioxide	0.330
Carbon Monoxide	0.376
Oxygen	0.346
Argon	0.340
Nitrogen	0.364
Ethylene	0.390
Nitric Oxide	0.317
Hydrogen Sulfide	0.360
Propylene	0.450
Nitrous Oxide	0.330
Propane	0.430
Chlorine	0.320
Benzene	0.585

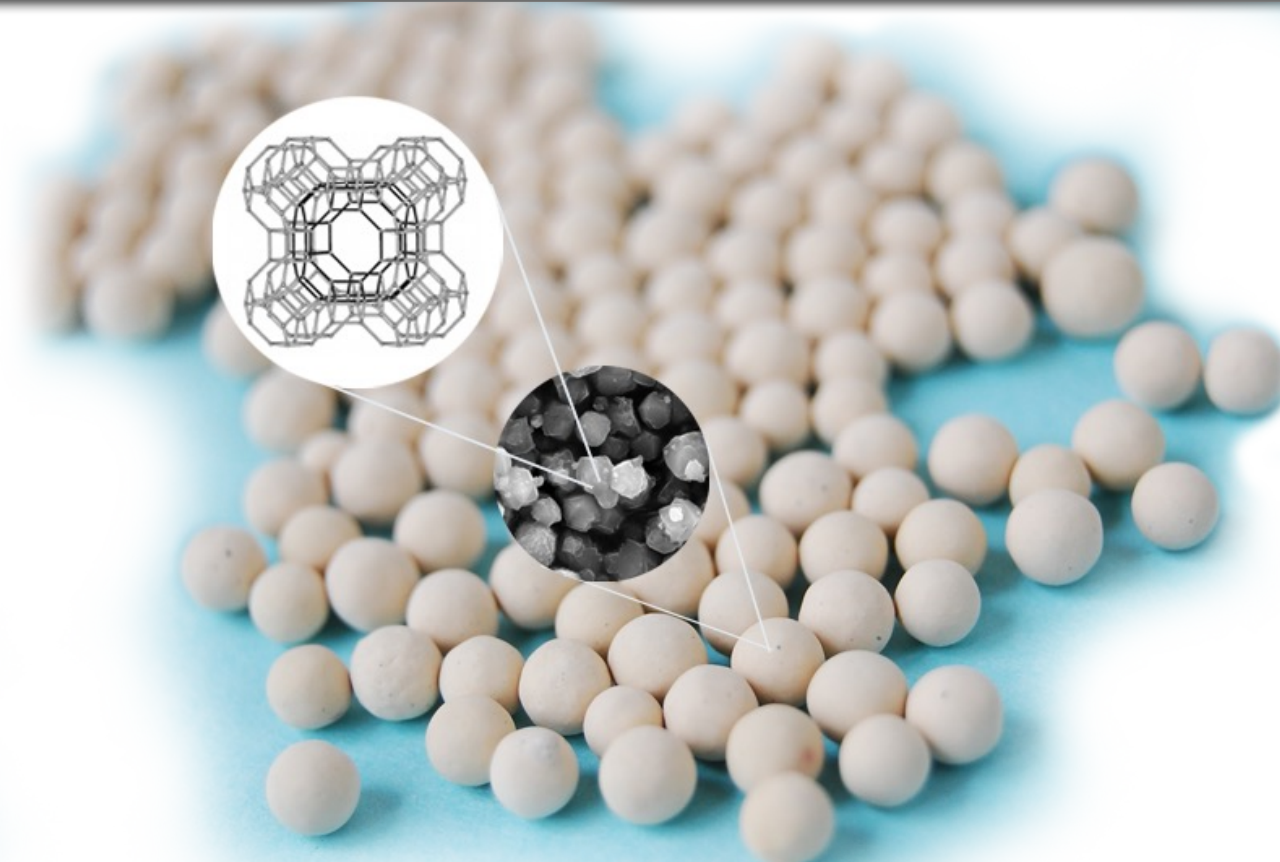
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Properties of zeolites.

- Stable solids with melting points of $\sim 1,000^{\circ}\text{C}$.
- Insoluble in water.
- Do not undergo oxidation in the presence of air.
- Zeolites rich in alumina are attracted to polar molecules like water.



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Difficulties with zeolites in manufacturing.

- Powder materials can produce a dust filled workplace.
- Zeolites are naturally hygroscopic and absorb moisture if exposed to air, resulting in reduced performance.
- Zeolites are dense and can settle/hard-pack in liquid.



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Select Pflaumer for your
molecular sieve needs.

- Remove dust in your workplace.
- Achieve uniformity in performance.
- Pflaumer proprietary technology addresses settling concerns.



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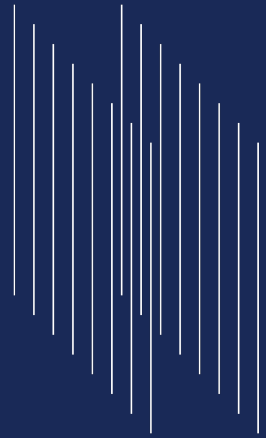
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Pflaumer Molecular Sieve Paste Offerings

Product Code	Carrier
60-7003	Castor Oil
60-7006	Polyether Polyol
60-7009	TERASPARTIC® 277



Thank you!



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For questions and sales support:

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