PETROTAT's Solutions

For Petrochemical Purification

پتروتات تجهیز خاورمیانه
(سهامی خاص)

Selective Adsorbents

For contaminant removal in olefin and polymer processes

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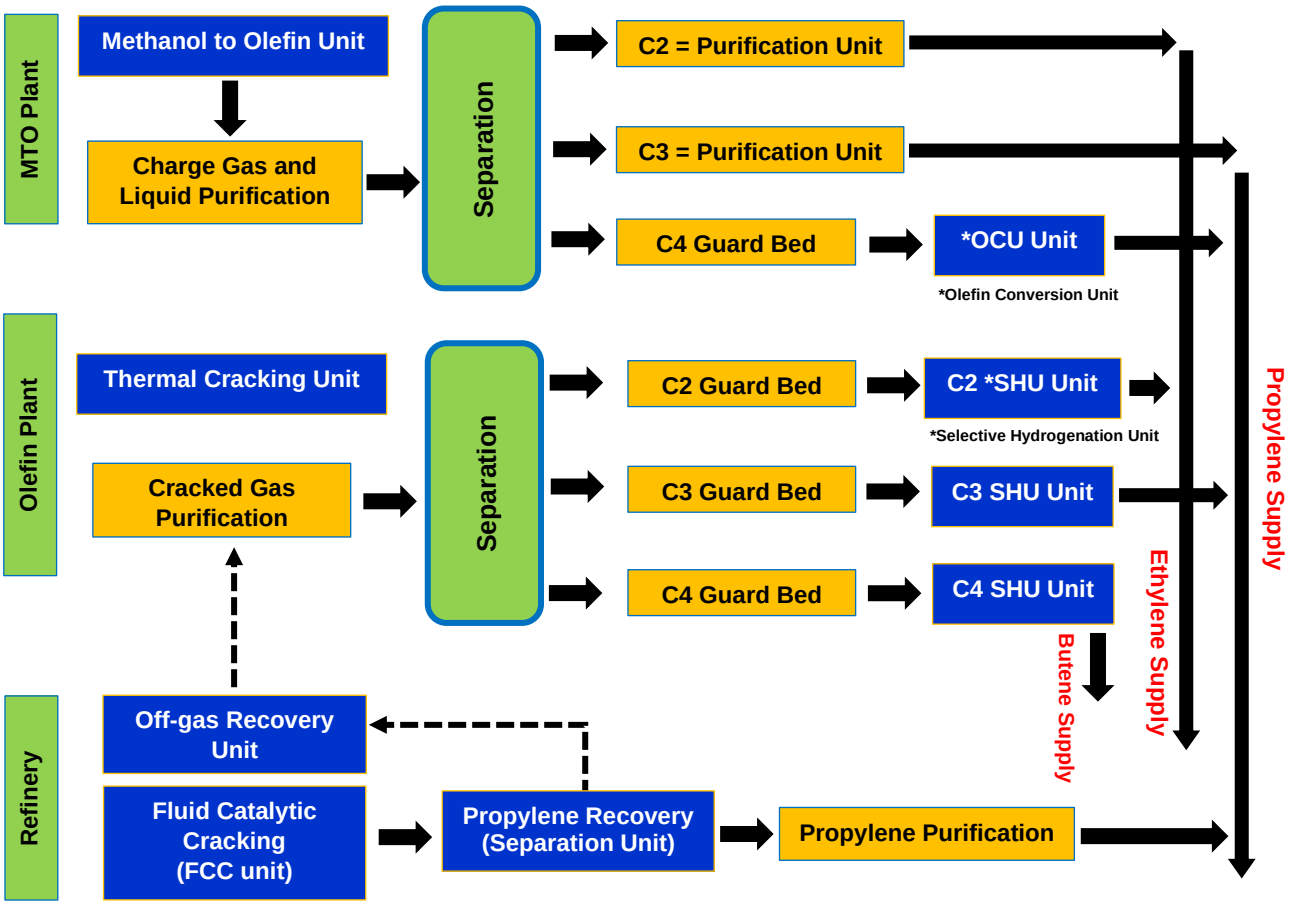
Introduction of Pursorb™ Adsorbents

Ethylene and **P**ropylene producers have faced the challenge of contaminants for decades. As catalyst technology in polymers production advances, the need for high-purity olefin process streams has become even more critical. The sensitivity to deactivating of the new generation of high activity/yield polymerization catalysts currently applied in the production of polyethylene, polypropylene and polystyrene mandates the removal of all trace of contaminants in the feed streams to ultra-low effluent specifications.

Important contaminants include H_2O, CO_2, COS, H_2S, NH_3, oxygenated hydrocarbons (alcohols, aldehydes, ketones, peroxides, ethers, etc.) and even AsH_3, PH_3. Selective adsorbents, both molecular sieve and modified alumina-based adsorbents, have been successfully used to help olefin producers manage their operations as contaminated feeds and increasingly sensitive polymerization catalysts continue to offer them rising challenges. Ultra-low effluent specifications for these concerned contaminants are attainable with the use of **Pursorb™** selective adsorbents in either a regenerative or non-regenerative operating mode.

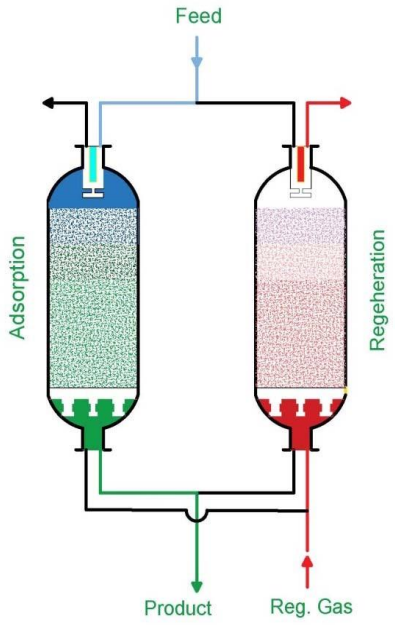
Applications of Selective Adsorbents in Olefin Purification Fields



Adsorption Technology for Deep Removal of Contaminants

Solid bed adsorption is the preferred separation technology for the removal of contaminants traces (typically polar or polarizable) from olefin. Petrotat molecular sieves, promoted activated alumina, and metal oxides-based adsorbents have the advantage of being able to operate in reactive environments without special processing steps. They are capable of removing detrimental impurities to extremely low levels to avoid endangering plant equipment, poisoning sensitive downstream catalysts and achieving design throughput.

The process typically involves passing the contaminated stream through one or more beds at ambient temperature to remove (adsorb) the contaminants, while simultaneously, heating a previously contaminant loaded bed with hot gas at a high temperature (250-290℃) to desorb the contaminants. Then the hot bed is cooled and ready for the next adsorption step. In recent years there has been a growing need for the removal of water and other contaminants in ethylene and propylene production.



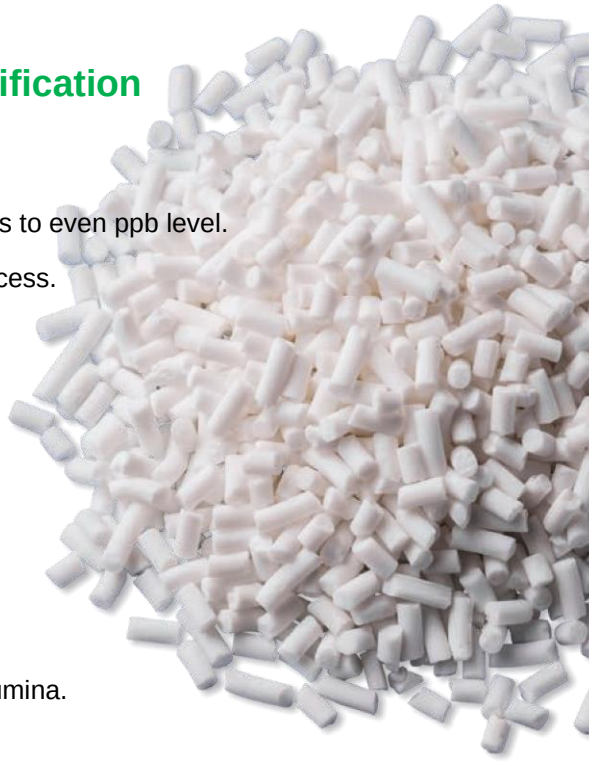
Contaminants Removal Through Adsorption Technology

Family of Contaminant	Contaminant	Contaminants Found resource	Typical Product	Regenerative Mode
Oxygenated Compounds	Water	Ethylene Propylene Co-monomers Solvents	3A-EPG	Regenerate
	CO2		AA-01Z	Regenerate
	Alcohols, Ketones, Aldehydes, Ethers, Carbonyls Peroxides	Propylene Co-monomers Solvents	MS-13Z	Regenerate
	CO, O2	Ethylene Propylene Co-monomers	C-18	Non-Regenerate
Sulfur Compounds	H2S COS	Ethylene Propylene Co-monomers Solvents	AA-01Z	Regenerate
	Mercaptans, Sulfides Disulfides	Propylene Co-monomers Solvents	MS-13Z 13X-PG	Regenerate Regenerate
Nitrogen Compounds	Ammonia Amines Nitriles	Propylene Co-monomers Solvents	MS-13Z 13X-PG	Regenerate Regenerate
others	Arsine & Phosphine	Ethylene Propylene	C-98	Non-Regenerate
	Mercury		MR-535	

Be Confident of Pursorb™ Adsorbents for Olefin Purification

From 2012, PETOTAT's Adsorption and Catalyst department have been focusing on the development of molecular sieves and other kinds of adsorption technology. We are pioneer in development of olefin purification adsorbent in Iran. Confidence also comes from our procedure of supplying adsorbents. For the aim of providing suitable products to meet specific production requirements, we control all aspects of product development from design to packaging and quality control. We offer highly reliable technical service.

Value offered by Petrotat's broad olefin purification products range:



- Highly effective removal of a wide range of contaminants to even ppb level.
- Complete purification solution target on customized process.
- Modified surface activity for safe olefin process.
- Long lifetime and easy operability.
- Outstanding technical support and after sales service.

Petrotat Olefin Purification Adsorbents:

- **Pursorb™** Molecular sieves and Modified Activated Alumina.
- **Pursorb™** Metal Oxide-based Adsorbents.

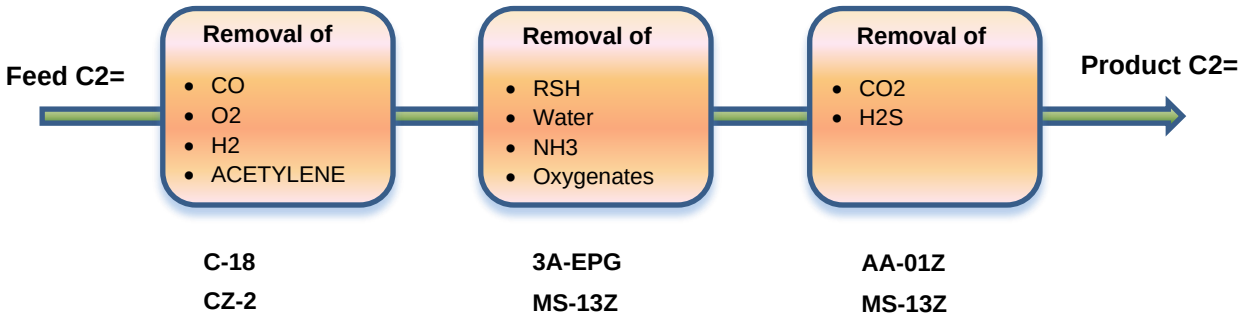
Polyethylene Production

Polyethylene (PE), which is the most common polymer in the world, mostly produced in slurry, gas phase fluidized bed reactor or combination of both processes in series (such as Spherilene and Borstar processes). Depending on its melting point, the PE is divided into several categories: low, medium and high density, each class with specific industrial applications. It occurs in the following forms: high density polyethylene (HDPE), LLDPE (linear low-density polyethylene), MDPE (medium density polyethylene), HMWPE (high molecular weight polyethylene).

To assure ideal catalytic activity of these new generation metallocene catalyst as well as latest Ziegler-Natta type catalyst, the olefin feed and co-monomer streams must be free of contaminants, which can bond to the transitional metal groups thereby deactivating the catalyst. Depending on the source (olefin plant steam cracker of ethane, propane or naphtha, FCC unit, or MTO process) of the feed ethylene stream to a polyethylene plant, potential contaminants can include H2O, CO2, H2S, CO, O2, CH3OH, NH3 and acetylene. Likewise, the comonomer feed stream (butane-1, hexene-1, octane-1, dienes and branched olefins) can be contaminated with H2O, H2S, CO2, COS, mercaptans and various oxygenated hydrocarbon compounds (alcohols, aldehydes, ketones, peroxides, ethers, etc.). The streams of polyethylene processes utilizing solvents (cyclohexane, isobutane, hexane, etc.) and reaction controlling gases (H2, N2) must be purified.

These contaminants can be removed by Petrotat **Pursorb™** Selective adsorbents to protect polymerization catalysts as follows:

Petrotat Adsorbents Portfolio for Ethylene purification



Attainable contaminant effluent specifications

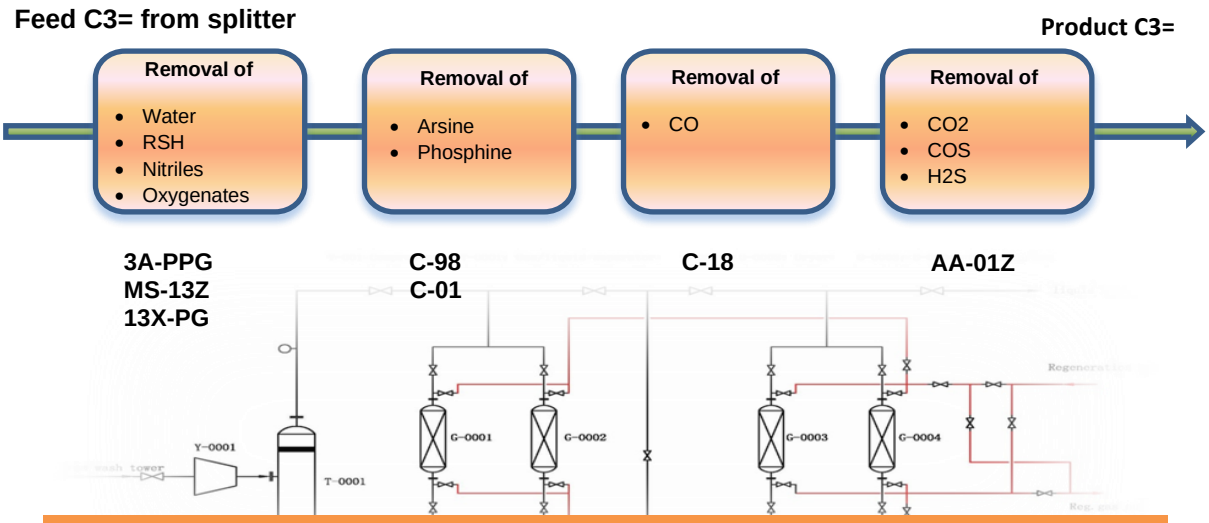
Contaminants	H2O, H2S, COS,	CO2	NH3, Oxygenates, Mercaptans	CO, O2, H2
Effluent limitation	0.1 ppmv	0.2 ppmv	1 ppmv	20 ppbv
Adsorption type	Physi and Chemisorption	Physi and Chemisorption	Physisorption	Chemisorption

Polypropylene Production

Polypropylene (PP) is produced by solution polymerization, hydrocarbon slurry, propylene slurry, gas phase and hybrid liquid/gas phase processes. Depending on the source of the feed ethylene stream (olefin plant steam cracker of ethane, propane or naphtha, FCC unit, or MTO process) to a polyethylene plant, potential contaminants can include H2O, H2S, COS, CS2, mercaptans, miscellaneous sulfides and disulfides, NH3, miscellaneous amines, amides and other nitrogen-based compounds, oxygenated hydrocarbons, AsH3, and PH3 if sourced from a petroleum refinery FCCU or olefin plant steam cracker. If propylene comes from MTO plant, potential contaminants may mainly include H2O and oxygenated hydrocarbons, such as CO, O2, Alcohols and Ethers. The feed ethylene stream to polypropylene production processes can also contain the contaminants detailed in the previous section.

Ziegler-Natta and metallocene SSCs activity in polypropylene processes can be assured via removal of these contaminants with selective adsorbents as follows:

Petrotat Adsorbents Portfolio for Propylene purification

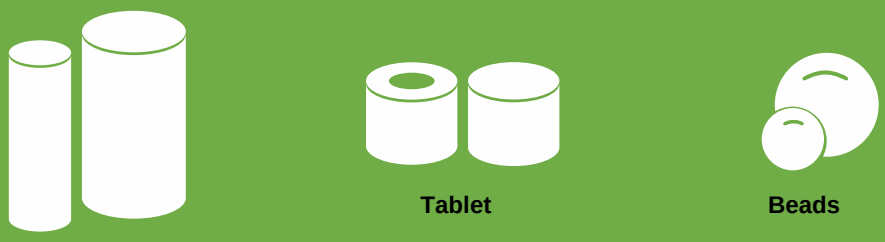


Contaminants	H_2S, COS	H_2O	Nitriles, Oxygenates, Sulfur Compounds	Arsine, PH_3, SbH_3, CO
Effluent limitation	30 ppbw	0.1ppmw	1 ppmw	20 ppbw
Adsorption type	Chemisorption	Physisorption	Physisorption	Chemisorption

Petrotat Pursorb™ Adsorbents at a Glance

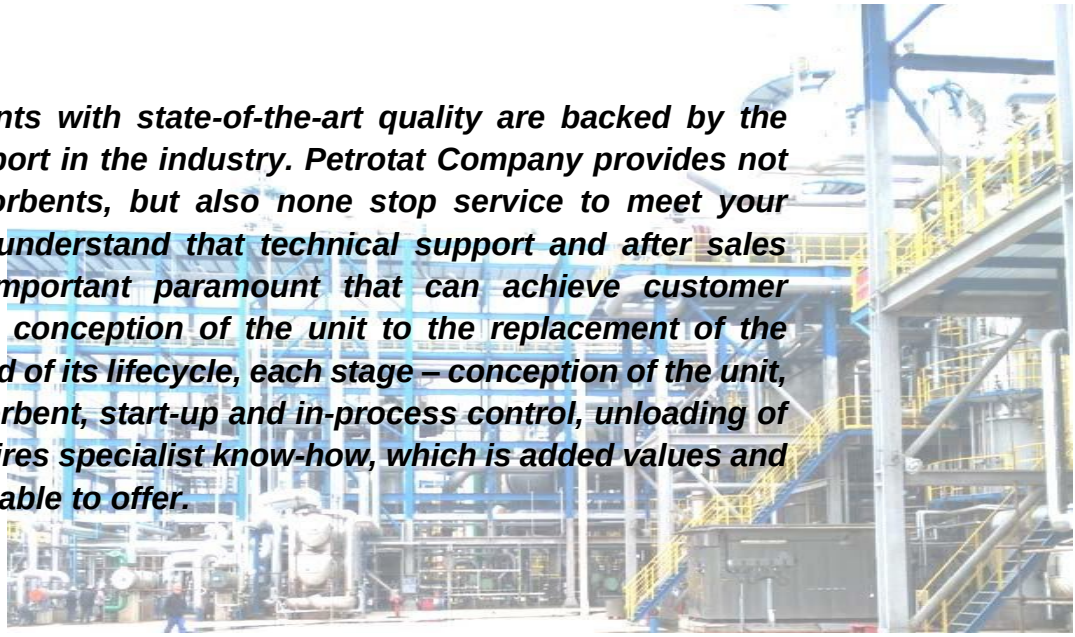
Adsorbents	Shape	Application
Pursorb 3A-EPG	Pellets	Deep dehydration from ethylene with excellent dynamic water capacity and very low hydrocarbon co-adsorption.
Pursorb 3A-EPG-2	Pellets	with optimized pressure drop, Deep dehydration from ethylene, appropriate dynamic water capacity and very low hydrocarbon co-adsorption.
Pursorb 3A-PPG	Pellets	Deep dehydration from propylene with excellent dynamic water capacity and very low hydrocarbon co-adsorption.
Pursorb AA-200	Beads	Superior water adsorption capacity when applied at high inlet H2O concentrations.
Pursorb AA-01Z	Beads	COS, CO2, H2S and CS2 removal from hydrocarbon streams and industrial gas.
Pursorb MS-05Z	Beads	Specially developed for Removal of water and methanol from unsaturated hydrocarbon streams, with very low heat release of adsorption.
Pursorb MS-13Z	Beads	• Alcohols, aldehydes, ketones, ethers, and various carboxylic acids removal from liquid hydrocarbon feed streams. • Removal of oxygenates, mercaptans, sulfides and disulfides from C4 raffinate streams. • Oxygenated organic compound removal from feed monomer, feed comonomer, and recycle solvent streams in polymer production processes.
Pursorb 13X-PG	Beads	Dehydration and Oxygenated organic compound removal from feed monomer, feed comonomer, and recycle solvent streams in polymer production processes.

Adsorbent	Shape	Active Components	Application
Pursorb C-98-I	Beads	CuO	Removal of traces of arsine, phosphine, COS, H2S, and other reactive compounds from Unsaturated hydrocarbons in vapor or liquid phase.
Pursorb C-98-II	Beads	PbO	Removal of traces of arsine, phosphine, COS, H2S, and other reactive compounds from saturated hydrocarbons in vapor or liquid phase, with ultra-low outlet at 2 ppbw.
Pursorb 513-1	Beads	MnOx	Catalytic removal of O2, H2, Sulfur compounds and others from ethylene, with effluent limitation at 100 ppbw.
Pursorb C-01	Tablet	Ag	Removal of traces of arsine, and other reactive compounds from Cracked gas or liquid, with 1 ppbw outlet limitation.
Pursorb C-18	Tablet	CuO, ZnO	Catalytic removal of CO, H2, Sulfur compounds and others from ethylene, with effluent limitation at 100 ppbw.
Pursorb CZ-1	Tablet	CuO, ZnO, ZrO2	Removal of CO from gas or liquid Unsaturated hydrocarbons streams at ambient temperatures, with effluent limitation at 30 ppbw.
Pursorb CZ-2	Tablet	CuO, ZnO,CeO2	Removal of CO from gas or liquid unsaturated hydrocarbons at ambient temperatures, with effluent limitation at 10 ppbw.
Pursorb MR-535	Beads	CuS	Removal of Hg from gas or liquid Unsaturated hydrocarbons at ambient temperatures, with effluent limitation at 10 ppbw.



We understand the feeling of customer

Outstanding and comprehensive customer service



Pursorb™ adsorbents with state-of-the-art quality are backed by the best technical support in the industry. Petrotat Company provides not only superior adsorbents, but also none stop service to meet your requirements. We understand that technical support and after sales service are our important paramount that can achieve customer success. From the conception of the unit to the replacement of the adsorbent at the end of its lifecycle, each stage – conception of the unit, loading of the adsorbent, start-up and in-process control, unloading of the adsorbent requires specialist know-how, which is added values and advantages we are able to offer.

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About Us

PETROTAT is one of the largest adsorbents suppliers in Iran. Stable quality and professional technique service are our sign which wins all of our consumers' reputation. To ensure our consumers' product setup to stably and efficiently work, PETROTAT helps to consumer to select right product and we also could help customers for design the process. Based on the idea "Technology-based trade, Quality-based survival" PETROTAT supply the highest quality of products and technical support.

PETROTAT – Your Assistant in Adsorption

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