

Filtration Products Guide



The highest quality ores in the world. Millions of years in the making.

EP Minerals' diatomaceous earth (DE) and perlite. Incredible minerals. There's nothing like them in the world today. There may be other ore deposits, but none with the characteristics of these minerals. Protected by layers of volcanic ash for millions of years. Incredibly consistent and pure. It's the reason why our DE and perlite make for the finest filter aids. And why our customers tell us we "meet their spec" time after time. The quality and uniqueness of EP Minerals ore deposits, no matter the mineral, are fundamental to the incredible functionality of these incredible minerals.

➤ INCREDIBLE MINERALS USED IN OVER 100 INDUSTRIES AROUND THE WORLD

Almost every industry around the world uses one of EP Minerals' incredible minerals. Our products are critical to over 100 industries, and we sell into 70 countries. DE is used in swimming pool filtration, paint and plastics, animal feed, oil absorbents, pharmaceuticals, and in the wastewater and petrochemical industries. DE is also used in food and beverage, corn wet milling, potable water, and fruit juices. Our perlite is used in filtration, construction, building materials and other industrial applications. EP Minerals also produces patented water purification media and arsenic removal products.

The wide variety of applications for our minerals continues to grow, and we pride ourselves on having the technical experience to provide our customers with solutions for even their most challenging applications.



➤ INCREDIBLY DIFFERENT

At EP Minerals, we're not like any other company. We're different. And we think that's a very good thing. What exactly do we mean by that? We're different in how we treat our customers, different in how we work with each other and our suppliers, and different in what we do and how we do it. We not only believe in being a good company to work for and a good corporate citizen in the communities where we live and operate, but we also believe in being a good environmental steward in how we conduct our business.



➤ INCREDIBLE TECHNICAL EXPERTISE FROM THE FILTRATION EXPERTS

EP Minerals believes in bringing incredible value to our customers by delivering more than a quality product. We also provide world-class global technical service to determine the best solution for your applications. We are providing more than just products. Our technical experts provide improved filtration results for our customers.

For our filtration customers, we have dedicated Technical Service experts, who are all located in the field. They travel to customer sites and conduct trials with our products, including optimization of the filtration process, operator training, and audit of the filtration process. We may even help you use less of our products!

EP Minerals' Filtration Training, Audit, and Optimization Process includes:

- Analysis of current filtration process
- Troubleshooting problems
- Optimization and process improvement
- Recommend products and usage guidelines based on:
 - Analysis of samples of customer filtration process streams at our R&D facility in Reno, NV
 - Analysis of current Filter Aid media



➤ INCREDIBLE CUSTOMER SERVICE

It's one of the top reasons that our customers continue to buy from us. Year after year. Our customer service team is passionate about taking care of our customers. Excellent customer service is something we believe all our customers deserve, and we do our best to make sure customers receive this level of service all over the world. We have fully-staffed customer service centers in Reno, Nevada and Munster, Germany – with additional support available through our global distribution network.

"When I think of a customer, I see two paths. The obvious path is the customer that pays for what we sell. To some, that could be a nameless, faceless entity. But not to EP. The customer is our life blood, our purpose, and to be successful, we need to treat that customer as more than just a number. It's not just the service we provide – anyone can do that – it is the partnerships we create with our customers. They provide us with opportunities to improve or innovate, with names and needs. When they ask for help, we do all we can or we assist them to find solutions. We listen. That's what our customers want – to know that they are important to us and that we listen to what they need or want. To acknowledge them efficiently and effectively, by hearing them, they will remember us."

– Missy Kyle-Fuller, Director of Customer Service, EP Minerals

➤ INCREDIBLE COMMITMENT TO QUALITY

Our mission is to consistently produce the highest quality products in the industrial minerals industry at all of our plants. Quality is an integral part of how we work and what we do. We have an entire team dedicated to quality, working with our Research & Development team, and directly with our plants to constantly test our incoming ores and finished products. Today, EP Minerals produces and ships DE and perlite products worldwide to hundreds of industries, including a large variety of food and beverage companies. Our quality management system is ISO 9001:2015 certified at many of our plants, and we are regulatory compliant around the globe.

➤ INCREDIBLE INNOVATION

Science and technology are playing an ever-increasing role in new product innovation in the world of industrial minerals today. Here at EP Minerals, we are committed to innovating, developing and manufacturing revolutionary new products from our diatomaceous earth (DE), perlite, clay and cellulose blends. These new products, which we call engineered minerals, expand the current boundaries of what our minerals have been known to do, as we work with customers to provide innovative solutions and develop new markets and applications.

- A full Research & Development team committed to new product development
- We engineer minerals using DE, perlite, clay and cellulose blends to create unique, high-performance products for industrial and consumer use



► INCREDIBLE R&D LABORATORY

Our R&D lab is fully equipped with state-of-the-art research instruments and test equipment including:

- X-Ray Florescence (XRF) Spectrometer (WDS Type)
- X-Ray Diffraction (XRD) Spectrometer
- Scanning Electron Microscopy (SEM) with X-ray Dispersive Spectroscopy (EDS)
- BET Surface Area Analyzer
- Particle Size Distribution Analyzer (Microtrac)
- Thermal Gravimetric Analyzer (TGA)
- Graphite Furnace Atomic Absorption (GFAA) Spectrometer
- Inductively Coupled Plasma (ICP) Spectrometer
- High Pressure Glass Reactors
- Ro-Tap Sieve Shakers
- High Efficiency Air Classifiers
- Automated Permeameter
- Milling Equipment

Test Methods Available

- Water and Oil Absorption Capacity
- Particle Size Distribution
- Free-Fall Density
- Tapped Density
- BET Surface Area
- Hardness
- Cation Exchange Capacity
- Particle Attrition
- SEM Imaging
- Bulk Chemical Composition
- Extractable Metals
- Permeability and Wet Bulk Density
- Centrifuged Wet Density
- Mineralogical Composition
- High Temperature Calcination
- Wet and Dry Sieve Analysis

► INCREDIBLE COMMITMENT TO SUSTAINABILITY

We don't just believe in being a good company to work for and a good corporate citizen in the communities where we live and operate. We also believe in being a good environmental steward in how we conduct our business. As important to us as our customers and our employees is our commitment to the sustainability of our operations around the world. Here are five ways that highlight that commitment:

- Our Research & Development team is committed to improving our products and developing new ones
- We have developed an EP Naturals™ line of organic, sustainable products
- We are committed to giving back in the communities where we live and operate
- We are investing in our manufacturing plants and equipment to improve efficiency, quality and reliability
- We have long-term reclamation plans and wildlife programs in place where we mine

We are committed to providing the highest quality industrial minerals products to our clients around the globe. And, we're aggressively pursuing new markets, developing new products and improving the products we make today using more efficient processes and technologies.

All over the world today, people are looking for alternatives to harsh chemicals and toxic products. We are making great strides in producing and bringing those products to market – for animal feed, for pet litter, for insecticide, soil amendments, and fertilizer carriers. We're making extensive capital improvements at our plants to reduce our CO₂ emissions and improve air quality. We support the local communities where we do business with good employment opportunities as well as provide economic benefits.





About DE

Diatomaceous earth (DE), or diatomite, is the skeletal remains of microscopic unicellular plants which lived in the ancient fresh and salt water lakes and oceans. The deposits mined by EP Minerals consist primarily of a particular species of fresh water diatom, the *Aulacoseira Granulata*. Its unique, strong, cylindrical geometry, high pore volume, and low resistance to flow make it an excellent filter medium.

► RECYCLING SPENT CAKE

Many of our customers use our minerals, primarily diatomaceous earth (DE) for filtration – for wine, beer, juice, and other beverages. After filtering the product, the customer is left with a by-product called “spent cake”. We’ve worked diligently with many of our customers to identify local sustainable alternatives to recycling the spent cake instead of it ending up in a landfill. In the wine country in California, we’ve worked with several customers to take the spent cake from wineries to recycle it into organic compost.

We’ve also worked with Iowa farmers to take the spent cake from filtration and recycle it into fertilizer. In one particular trial, this effort potentially diverted 9000 tons of waste from going to a landfill.

At the moment, we’re running several DE spent cake recycling programs for customers, using varied sector-specific technologies for a variety of different industries. Diatomaceous earth is sustainable. If you’re interested in recycling your DE spent cake, please contact us.



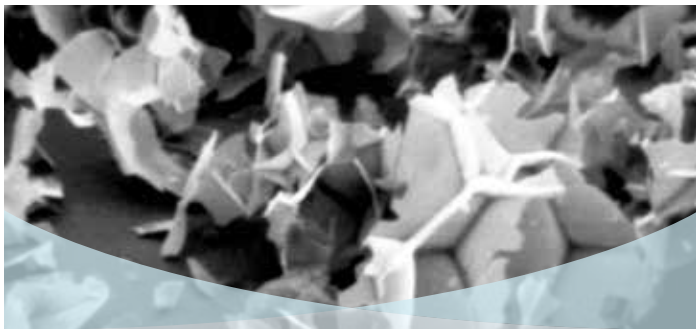
EP Minerals surface mines the ore from deposits in Nevada and Oregon where the ore is sun dried before transport to the processing plants. Once at the EP Minerals’ processing plants, the raw ore is crushed and pyro-processed to remove all organics, resulting in a pure, chemically inert filter media. Through this pyro-process, we agglomerate the DE to the desired particle size distribution for the grade being produced. A wide selection of grades is manufactured to meet the filtration requirements of many applications.

Our **Celatom® DE** deposits consist exclusively of freshwater diatoms with up to 98% of the *Aulacoseira Granulata* species. What does that mean to you? This rare type of DE is cylindrical in shape, and the high pore volume of these diatoms provide high mechanical strength, natural filtration and absorption capabilities. This high quality, high purity DE deposits are known for their low density, high porosity, high surface area, abrasiveness, absorptive capacity and brightness.

Our unique DE, combined with EP Minerals amazing customer service and technical expertise, are the reasons that so many customers choose EP Minerals over and over again.

About Perlite

Perlite is a hydrated, naturally-occurring volcanic glass containing entrapped water. When superheated, the perlite turns to liquid molten glass and the molecular combined moisture is released as water vapor. When heated above 1600° F, the water bound in the rock vaporizes, causing perlite to expand up to 20 times its original size. As a result of the rapid release of the moisture, multi-cellular, irregular glass bubbles are formed. These glass bubbles are then milled to varying particle sizes to form perlite filter aids.



With its unique morphology, expanded milled perlite has excellent properties for removal of difficult to filter suspended solids. The morphology coupled with the resulting light density allow perlite filter aids to retain large volumes of suspended solids while maintaining excellent permeability. Our **Celatom® Perlite's** inert composition has an extremely low bulk density and meets most purity requirements. It's effective for a wide range of filtration applications, especially those requiring high throughput and moderate clarity.

Our perlite filter aids are available in a full range of grades with specific permeabilities which produce varying degrees of clarification. The products are functionally similar to diatomaceous earth (DE) filter aids; however, they typically have bulk densities about half that of DE. Celatom perlite meets the purity requirements of many applications, except those requiring the highest degree of clarification (such as polishing).

- Very low “dry & wet” bulk densities
- Non-detectable levels of crystalline silica
- Higher solid holding capacity in coarse applications
- Works well in coarse non-critical filtrations and dewatering applications (wastewater)

About Cellulose and Cellulose Blends

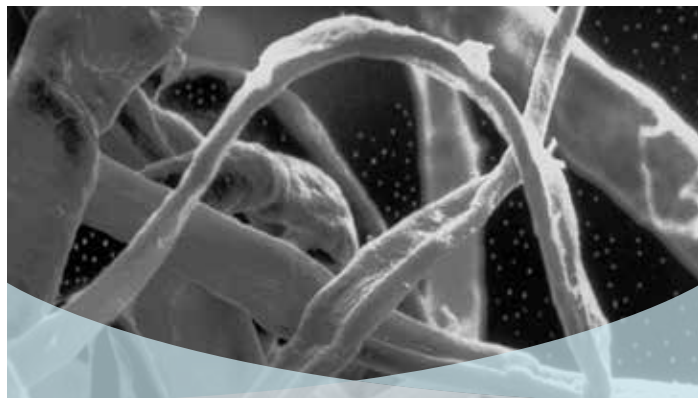
Cellulose fibers are derived from purified virgin wood pulp. Cellulose is a low ash product and is relatively inert to acids, alkalis, and solvents. It is the preferred filter media for processes sensitive to silica. EP Minerals offers two cellulose-based product lines: Pre-co-Floc and Dialose.

Pre-co-Floc® is a 100% pure cellulose powdered product. **Dialose®** products are a pre-blended, easy-to-use product composed of high quality, Celatom diatomaceous earth (DE) and Pre-co-Floc cellulose fibers.

EP Minerals' **Celatom® Floc** is a blend of organic and inorganic media of different shapes and sizes, such as highly purified cellulose, cotton fiber, diatomaceous earth and perlite. Celatom Floc grades are specialty, high-purity, chemically inert filter aid used to complement other filter aids, such as diatomaceous earth and perlite. They were developed to function as a primary precoat and/or bodyfeed. We offer three grades to best meet our customers' application needs.

- Celatom Floc 30 for Polish Filtration
- Celatom Floc 10 for Medium Filtration
- Celatom Floc VAC for Coarse Filtration

The combination of the uniform blending process and natural variation in the particle size and shape provides the precoat cake with elasticity to resist pressure bumps and other filter upsets. The use of Celatom Floc also greatly reduces bleedthrough and delivers a high clarity filtrate faster than just DE or perlite alone, improving plant productivity.



DE bridges the screen openings and forms a precoat.

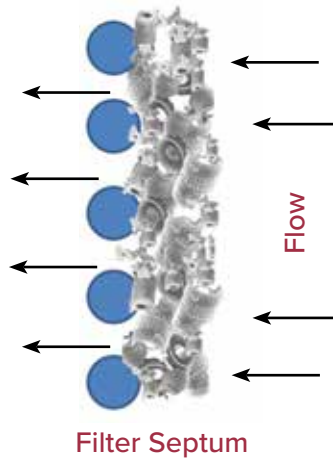


Fig. 1

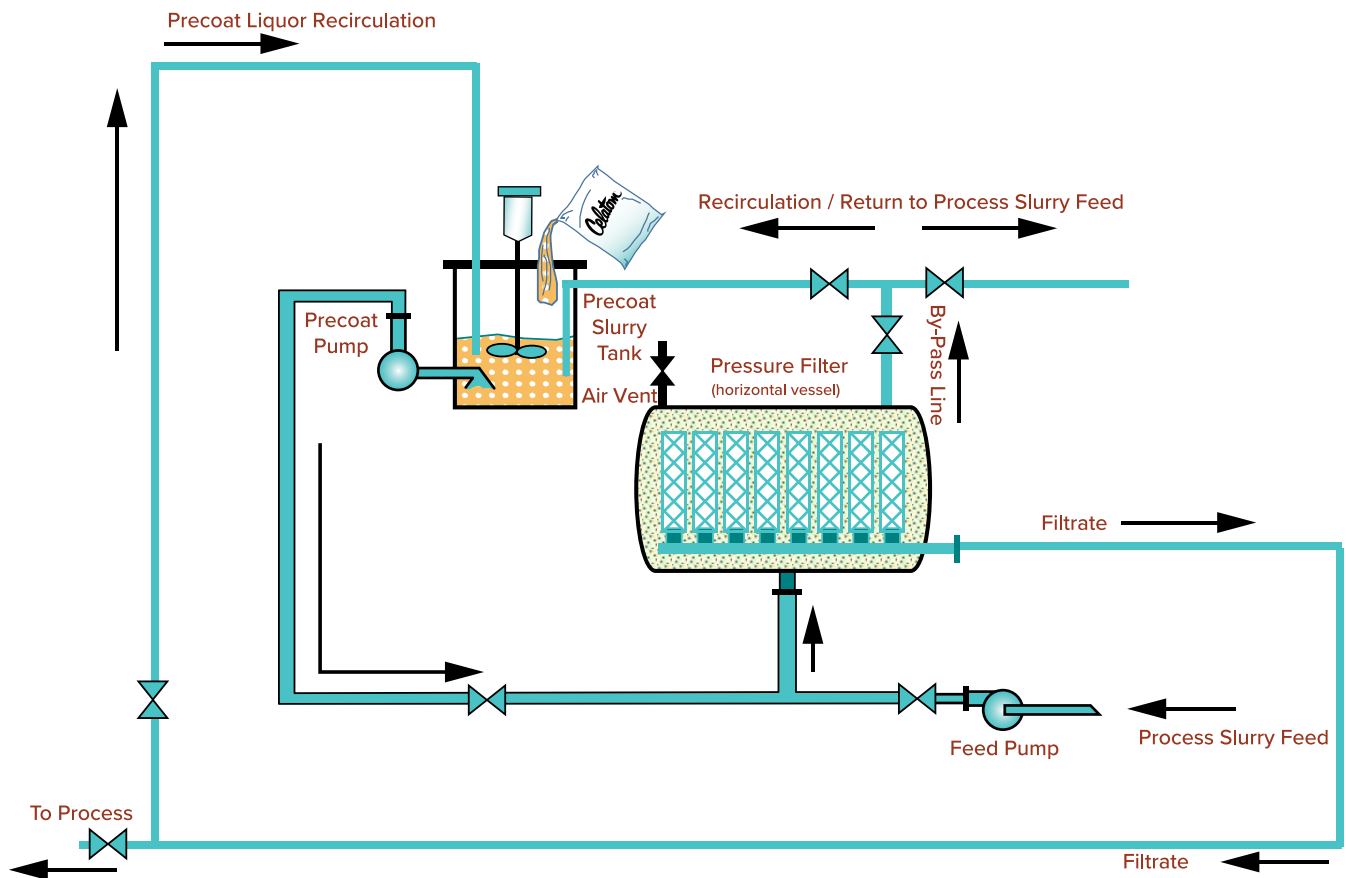


Fig. 2

Our incredible minerals can make your product even more incredible

➤ FILTRATION OVERVIEW

Pressure filtration (Fig. 2)

Solid/Liquid separation with diatomite filter aids on a pressure type filter systems (pressure leaf, candle filters, or filter presses) is a two-step process. First, a thin protective coating of filter aid (“precoat”) is applied. Then small amounts of diatomite, or “bodyfeed,” are added to the liquid being filtered, trapping and removing solids from the liquid while maintaining sufficient permeability throughout the filter cycle.

Precoat (Fig. 1)

A thin (1/16” (1.6mm) – 1/8” (3.2mm) thick) precoat layer is built up on the filter septum. The precoat is applied by recirculating a slurry of diatomite and clean water (or filtered clean process liquor) between the precoat slurry tank and the filter (Fig. 2). The filter septum is merely a support for the diatomite precoat and does not function to remove particulates from the liquid. The basic functions of the precoat are to:

- establish immediate filtrate clarity
- prevent blinding of the filter septum and prolong septum life
- enhance filter cake release, reducing filter clean up time
- maintain filtrate clarity throughout the filtration cycle

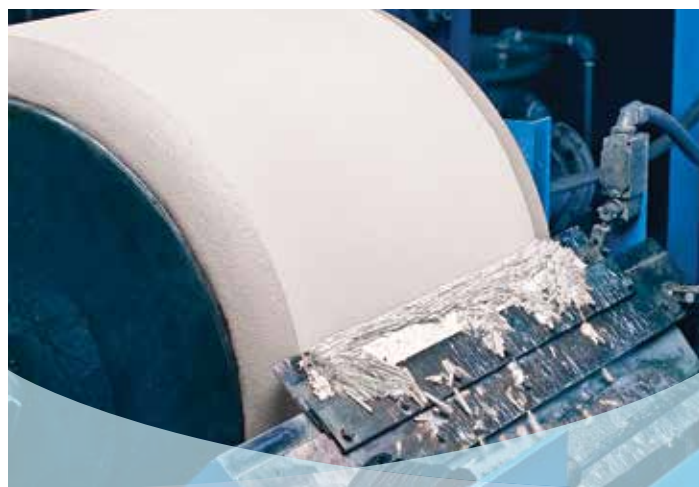
Bodyfeed

The filtration of liquids containing gelatinous, slimy, and/or compressible solids typically result in poor filtration performance, low flow rates, and very short cycle times. The addition of non-compressible solids as bodyfeed can improve the performance of the filtration operation in these situations. Celatom® DE has consistent quality, high permeability, and rigid non-compressible characteristics that work especially well as a bodyfeed. The addition of a bodyfeed changes the physical characteristics of the formed filter cake by increasing its permeability and reducing

its resistance to flow. The addition of bodyfeed reduces flow resistance of the formed process solids. The relative resistance of compressible solids is high and rises with increasing operating pressures and solids deposition.

Rotary vacuum filtration

Rotary Vacuum Precoat Filters (RVPF) are designed to filter a wide variety of high solid liquids that would otherwise blind or block other types of filters. RVPF’s can maintain high filtration rates while removing slimy, sticky, oily and blinding solids. Applications range from process liquids like pharmaceutical and food products to waste water sludges.



The right incredible minerals. The right grade. The right process. It makes all the difference for your products.

➤ CHOOSING THE RIGHT FILTER AID

We offer an incredibly wide range of Celatom® filter aid grades for any filtration application. It is important to choose the correct grade that will give the lowest cost per unit volume of filtered product while maintaining an acceptable clarity level at maximum allowable throughput. Our experienced salespeople and technical experts can help you choose the right filter aid for your industry and application.

► OUR TRADITIONAL FILTER AIDS

Celatom® Filter White (FW) flux-calcined diatomaceous earth (DE) ranges in color from bright white to light pink. These filter aid grades have a wide range of filtration capabilities and a wide range of particle size removal properties. Our filter white products have a permeability range of 420-20,000 millidarcies. Filter White filter aids are available in the following grades: FW-6, FW-12, FW-14, FW-18, FW-20, FW-40, FW-50, FW-60, FW-70 and FW-80.

Celatom® Filter Pink (FP) grades of diatomaceous earth (DE) are calcined and light pink. These grades make for an excellent filter aid, especially as a polish filter aid. Permeability is between 60-1300 millidarcy. Filter Pink filter aids are available in the following grades: FP-1, FP-2, FP-3, FP-4, FP-6 and FP-22.

Celatom® Filter Natural (FN) diatomaceous earth (DE) grades are low crystalline-silica, low permeability products, used primarily as filter aids in filtration. These natural products are off-white in color and have a permeability range of 30-115 millidarcy. Filter Natural filter aids are available in the following grades: FN-1, FN-2 and FN-6.

Our high purity grade CelaBrew, has reduced soluble iron and increases beer shelf life and stability.

- The clear filtration choice
- Specifically designed to meet the high quality demands of the brewing industry
- Lower sodium and calcium than standard filtration grades
- Strict Quality Control testing to ensure the lowest sensory detectability possible



CelaBrew®

The most experienced brewers in the world today use diatomaceous earth (DE) filter systems. Why? No other filter system can produce the amazing results of a DE filter. Known for being a “low metals” filter aid, CelaBrew DE filter aids remove fine particles from beer without affecting the color, flavor, or body of the beer.

➤ OUR SWIM POOL FILTER AIDS

Our customers tell us every day – There’s no substitute for Celatom® diatomaceous earth (DE) and CelaPerl® perlite when it comes to filter aids for swimming pool filters. For over 50 years, EP Minerals’ Celatom DE has been the worldwide choice for swimming pool and spa filtration products. EP Minerals unique DE and Perlite have the chemical characteristics that make our products the perfect filter aid for the swimming pool and spa industry.

Celatom® SP

Celatom diatomaceous earth (DE) for swimming pools provides the ultimate in water clarification for a pool or spa that truly sparkles. DE is the most efficient dirt removing filter aid available, removing particles down to 2 microns. A properly balanced pool, using DE filter aid, gives you the clarity and quality you’re looking for, reducing the use of chemicals and disinfectants.

- Provides a sparkling pool day and night
- Filters out particles associated with recreational water illness
- Enhances filter productivity reducing chlorine & shock use



CelaPerl®

CelaPerl is a lightweight perlite filter media for swimming pools and spas. Perlite originates from naturally occurring volcanic rock containing water. When heated, the perlite expands to 20 times its original volume and becomes an excellent filter media. CelaPerl is non-toxic and environmentally friendly, providing good pool clarity and improved oil absorption.

CelaPerl is used in the same manner as diatomaceous earth. Simply precoat your filters with the same number of scoops you use today.

- **Easy to Handle**
Lightweight Bags Makes it Easier for All to Use
- **Environmentally Friendly**
All Natural, Non-Toxic Product
- **Good Clarity**
Removes Particles Down to 4.0 Microns
- **Improved Oil Absorption**
Provides a Cleaner Pool



CelaPool®

Create a beautiful, sparkling clean pool today with CelaPool. It gives you all the benefits of Celatom® DE, the #1 choice of pool pros for swimming pool filtration, using a brand new patent-pending technology. CelaPool is uniquely designed for easy handling and application with low dust, less mess and less waste. Get the clean, clear pool you want with CelaPool, the better DE filter aid.

- **LOW DUST!**
- Celatom DE is the #1 choice of swim pool professionals
- Easy to use. Less mess. Less waste
- New thermally sealed bag for cleaner handling and storage
- Blends quickly into water. Does not “float” on top



► OUR SPECIALTY FILTER AIDS

PurifiDE®

PurifiDE, our purest diatomaceous earth filter media (permeability 300 mD or 1200 mD) are used for filtering high value liquids where extractable elements are of concern. PurifiDE is manufactured using proprietary and controlled manufacturing and quality control processes to meet USP-NF standards for Purified Siliceous Earth. Extractable elements of common concern are below 10 ppm (arsenic below 1 ppm).

PurifiDE is ideal for:

- Plasma fractionation
- Clarification of cell culture supernatants, and fermentation broths
- Purification of delicate oils sensitive to oxidization
- Filtration of cell culture media components, including peptides and peptones
- Distilled beverage filtration
 - Whiskey and bourbon
 - Sake
 - Green tea



- Removes arsenic in waters up to pH of 10 without chemical pretreatment
- Retains bound arsenic during pH upset
- Effectively removes arsenic in the presence of competing ions, including silica and phosphate
- Removes other contaminants – phosphate, chromium, selenium, fluoride, antimony, lead and more
- Dry media – Easy to use, free flowing
- Meets TCLP requirements after breakthrough



NXT®-2

NXT-2 is a patented adsorptive granular filter media for removing arsenic from drinking water. A mixed-metal product, NSF-certified NXT-2 is uniquely formulated for high arsenic adsorption, while providing safe and stable removal.

NXT-2's benefits include:

- Removes arsenic to meet regulatory standard
- High capacity for arsenic adsorption
- Provides the lowest adsorptive treatment cost per 1000 gallons

Manufacturing Plants

EP Minerals HQ
Reno, NV 89521

Celatom Plant
2630 Graham Blvd.
Vale, OR 97918
Diatomaceous Earth

Blair Plant
320 South Industrial Park Dr.
Blair, NE 68008
Perlite

Colado Plant
150 Coal Canyon Rd.
Lovelock, NV 89419
Diatomaceous Earth & Perlite

Fernley Plant
I-80 Exit 65
Fallon, NV 89406
Diatomaceous Earth

Clark Plant
640 Clark Station Rd.
Sparks, NV 89434
Diatomaceous Earth

Middleton Plant
220 Highway 125 South
Middleton, TN 38052
Montmorillonite Clay

EP Engineered Clays Plant
600 E McDowell Rd.
Jackson, MS 39204
Bentonite Clay

©2018 EP Minerals, a U.S. Silica Company • EPM228-4