

Micro-Cel[®]

Synthetic Calcium Silicates

What is Micro-Cel?

Micro-Cel is the registered trade name for a line of synthetic calcium silicates produced by the hydrothermal reaction of diatomaceous silica and high purity lime. The physical and chemical properties can be controlled and altered by adjusting processing conditions to provide a wide range of specific product characteristics that maximize the performance of these unique products to meet industry needs.

Micro-Cel products are designed to function as inert absorbent carriers, chemisorbents with specific attractive properties, conditioning agents, anti-caking agents, diluents, excipients, tableting agents, grinding aids, pigment extenders, bulking agents, and thermal insulating materials.

Multifunctional Product Properties

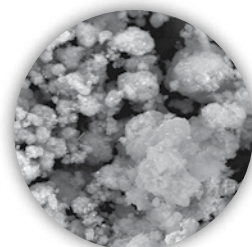
The primary unique physical and chemical properties that combine to provide functional benefits in many manufacturing applications include:

High liquid absorption capacity allows for Micro-Cel products to absorb, or carry, from three to six times their own weight in liquid products and still remain a free flowing powder.

Low bulk density and flowability make Micro-Cel products excellent additives as conditioning, flow controlling, and anti-caking agents, and outstanding thermal and cryogenic insulating materials.

High surface area (95 to 180 meters²/gram) and specific adsorptive properties can be employed to remove undesirable contaminants from product intermediates, including free fatty acids, phospholipids, and certain heavy metals.

Unique particle morphology is the result of carefully controlled processing conditions during the production of Micro-Cel products. The ultimate particle size of Micro-Cel has been calculated to be as small as 0.02 to 0.07 microns. However, through agglomeration, these very fine particles form aggregates, some as large as 100 microns. These structures vary from stacks of thin plates or sheets to spherical particles, some even resembling crumpled tissue paper.



Typical Micro-Cel photomicrographs

Successively higher magnifications illustrate the intricate particle and internal pore structures of a typical Micro-Cel sample.



IMERYS

Micro-Cel Applications

Agricultural Chemicals: High absorption and good flow properties make Micro-Cel products excellent carriers in the production of wettable or dry powders for crop protection applications, and flow control agents for feed supplements and additives, at very low levels of addition.



Cleaners and Detergents: Minimal additions of Micro-Cel can convert cleansers and detergents with poor flow characteristics to dry, free-flowing powders, even after long storage periods under adverse conditions of high heat, humidity, and packing pressure. Micro-Cel products can also be employed as carriers for additions of key ingredients, such as perfumes in carpet deodorizers, powdered hand soaps, household and commercial cleansers, and laundry detergents. The unique morphology of Micro-Cel helps retain the desired fragrance in the material being cleaned. It can also carry wetting agents into concentrated detergents and fabric softeners, and oils and emulsifiers into facial powders and cleansers.

Food Products: Owing to their high absorptive capacity and unique morphology, Micro-Cel C and Micro-Cel E are effective anti-caking and free flow promoting materials when mixed at very low dosages in a variety of hygroscopic food products, most notably seasonings, baking powder, soup mixes, dried cheese and other dehydrated foods, and artificial sweeteners. Micro-Cel products are used to prepare dry liquids of viscous or concentrated ingredients for food preparations, including molasses and various food flavorings, extracts, and



vitamins.

Also, Micro-Cel T-49 is an excellent adsorbent for the removal of free fatty acids in edible cooking oils, extending the useful life of oils in industrial frying applications and thereby improving the consistent quality of fried foods.

Hazardous Waste Disposal: Micro-Cel E can be used to absorb low level radioactive wastes, and other hazardous liquid wastes, for disposal with reduced potential for container leakage and contamination.

Insulation: The low permeability and bulk density of Micro-Cel products are well suited for specialized cryogenic insulation applications. A bed of Micro-Cel contains microscopic "dead air" spaces that dramatically increase thermal insulating efficiency and reduce heat transfer.

Pharmaceuticals and Cosmetics: Micro-Cel is used as an anti-caking agent in cosmetics, and as a tableting aid or excipient in certain vitamin formulations. It is especially effective at carrying Vitamin E into powdered animal feed flavorings. As an excipient, Micro-Cel will permit high liquid content in tablets with minimal friability, and reduce the need for lubricating agents. Tablet compressibility and recompressibility characteristics are excellent.

Rubber Goods: Micro-Cel E is widely used in compounds where high oil loadings or other viscous liquid additions, including antioxidants, plasticizers, and adhesives, are required. Its use as a dry liquid concentrate carrier hastens the incorporation of the ingredient into the batch, improves handling and metering, and reduces processing time substantially. Micro-Cel has little or no effect on the physical properties of the rubber product, with the exception of a small



Multifunctional

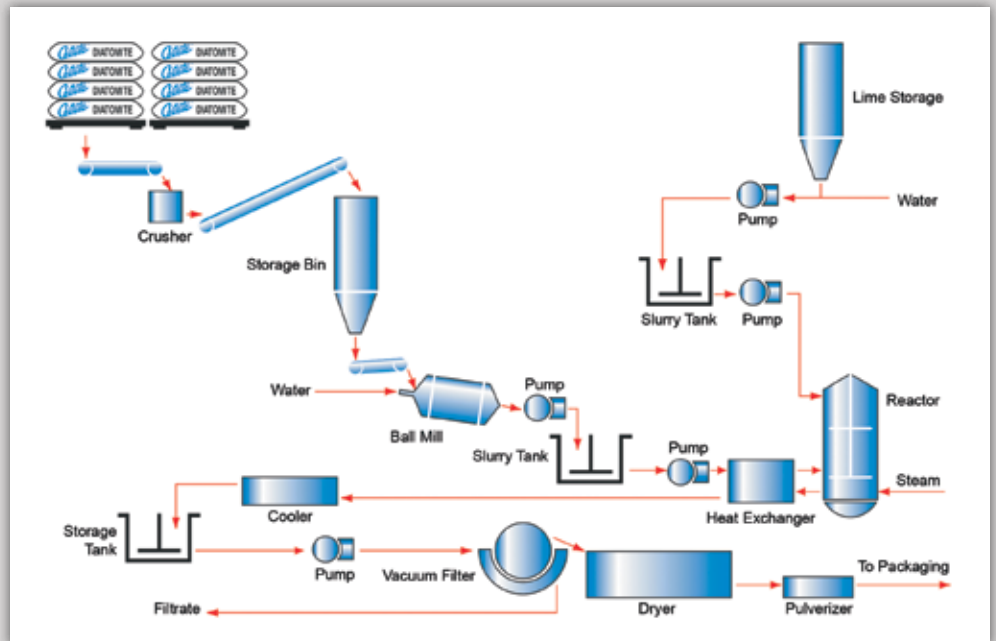
decrease in modulus. Experience has shown that dry, free-flowing powders containing 60 – 85% liquid can be prepared, depending on viscosity and melting point of the liquid.

Paper: The high porosity and low bulk density of Micro-Cel make it effective in the production of specialty papers and other wet laid materials. It is ideally suited for both neutral and alkaline systems, where it provides high bulking, superior opacity, and improved printability to the sheet.

Other Applications: The potential uses for these versatile and unique materials are as diverse as industry's need for extraordinarily high absorption capacity, very low bulk density, and/or specialized adsorption capabilities. A few examples are the removal of organic and inorganic acids from solvents, organic chemicals and plasticizers; grinding aids for low melting point solids or oily/high moisture content materials; and conditioning agents for powdered materials such as resin molding powders, pigments, dyestuffs, and explosives.



MANUFACTURING PROCESS



This schematic representation of the Micro-Cel manufacturing process illustrates key processing steps. Celite® diatomite is a basic raw material, and its preprocessing treatment has a critical impact on the physical and chemical properties of the Micro-Cel end products. In the production of Micro-Cel E, for example, the raw materials are carefully conditioned in order to ensure that the final product is virtually crystalline silica free. The “heart” of the manufacturing process is the reactor, in which diatomite and lime are combined in water under precise heat and pressure conditions over time, and the carefully controlled conversion to the desired calcium silicate mineral phase is accomplished.



Micro-Cel® Typical Properties

PHYSICAL PROPERTIES

PRODUCT	APPEARANCE	BRIGHTNESS	BULK DENSITY (g/L)	WATER ABSORPTION, % BY WT.	OIL ABSORPTION, % BY WT.	150 MESH SCREEN, % RETAINED	325 MESH SCREEN, % RETAINED	MOISTURE CONTENT, % BY WT.	SPECIFIC GRAVITY
MICRO-CEL® C	White	86	138	405	330	...	4.0	8.0	2.2
MICRO-CEL® E	Gray	60	86	550	420	...	6.0	5.5	2.2
MICRO-CEL® T-38	White	88	139	370	290	1.0	2.5	8.0	2.2
MICRO-CEL® T-49	Gray	60	192	240	190	1.5	10.0	6.0	2.2
CELKATE® T-21	Gray to buff	58	208	220	180	0.1	3.5	4.0	2.4
SILASORB	White	--	192	--	--	6.0	16.5	5.5	2.3

CHEMICAL ANALYSIS (%)

PRODUCT	SiO ₂	Al ₂ O ₃	Na ₂ O + K ₂ O	Fe ₂ O ₃	CaO	MgO	IGNITION LOSS	pH
MICRO-CEL® C	50	1.8	1.3	0.6	27	0.5	26	10.0
MICRO-CEL® E	47	2.5	1.2	0.7	32	0.6	22	8.4
MICRO-CEL® T-38	50	1.8	1.3	0.6	27	0.5	26	9.0
MICRO-CEL® T-49	46	2.3	0.5	0.5	33	0.8	27	10.0
CELKATE® T-21	65	4.0	1.0	1.1	0.4	14.9	12	7.3
SILASORB	47	2.0	1.4	1.0	28	0.6	15	9.7

The physical properties of the products represent typical values obtained in accordance with Imerys test methods and are subject to manufacturing variations. They are provided here as a general reference only, are subject to change without notice, and should not be relied on for any particular application.

Total Product Support

Imerys Micro-Cel synthetic calcium silicates offer consistently high quality products, dependable sources of supply, superior technical support, and unsurpassed customer service. In addition, our extensive Research and Development Department is continually seeking to develop new products to assist our customers in achieving the maximum functionality and quality in their products.

Micro-Cel synthetic calcium silicates are available on a direct basis and through our international network of authorized distributors. For more information on our Micro-Cel brand minerals additives, or to locate a distributor near you, please contact us at www.imerys-filtration.com



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