

## SilaFresh™ Additive: Encapsulant for Extended Release

### About ABS Materials Inc.

[www.absmaterials.com](http://www.absmaterials.com)

ABS Materials is headquartered in Wooster, Ohio and serves diverse markets. The company's core competency is material science innovations centered around a patented suite of organosilica materials that volumetrically change upon absorption of organics. ABS Materials manufactures SilaFresh Additive, several granular medias, and commercial products.

### What is our innovation?

A highly elastic and porous silica that can be used to extend the delivery of fragrances and active ingredients. SilaFresh additive can also adsorb malodors, even when loaded with fragrances. Applications include perfumes and body sprays, deodorants, and fragrance delivery from detergents.

### Description of SilaFresh™ Additive:

SilaFresh additive for home and personal care applications is a specially designed absorbent material that can be loaded at high capacity with fragrances and active ingredients. A proprietary synthetic process leads to microscale morphology that allows SilaFresh additive to swell and absorb at least 400% its weight in fragrance. The swelling is reversible allowing SilaFresh additive to be easily loaded with active ingredients, such as fragrances for extended delivery.

### Properties of SilaFresh® Additive

Physical state	Semi-transparent porous solid
Surface chemistry	Hydrophobic siloxane
Surface area	90 m <sup>2</sup> /g
Pore volume	0.65 (mL/g) dry state
Density (empty):	0.4 g/mL
Pore Size	<90% under 6 nm
Swell capacity	5.5 mL/g (organic liquids)
Thermal Stability:	>300°C
Particle size:	Millable to customer specifications without loss of function
CAS No.:	1914981-02-4
INCI name:	Dimethicone/Phenyl Silsesquioxane/Phenyl Bis-Silsesquioxane Crosspolymer
Staining:	None
Shelf life:	>5 years

## Active Ingredient Delivery

Prolonging the volatilization of fragrances or extending the delivery of other active ingredients is key in creating home and personal care products that have extended and balanced sensory stimuli. Advanced materials that can change their physical properties such as porosity as a function of a stimulus have great potential for fragrance delivery as they combine the advantages of both entrapment and stimulated release. ABS Materials has developed SilaFresh additive as an entrapment system for active ingredients. Swelling allows the liquids, such as neat fragrances and essential oils, and solutions, including active ingredients, to be entrapped within the nanoporous network. Neat fragrances or essential oils can be fully encapsulated within the matrix. Likewise, solvent can be removed by evaporation at room temperature leaving the dissolved solutes to be entrapped in the matrix for extended release by hindered diffusion.

### Literature

Technical details of active ingredient delivery can be found:

P.L. Edmiston Nanoporous Organosilica for Extended and Triggered Release, *Cosmetics and Toiletries: Applied Science*, 754-762 (October 2013).

### Example: Extended Delivery of Menthol.

Delivery rate of encapsulated solid and liquid odorants has been demonstrated using menthol, hexanol and dodecane. The rate of release for menthol was measured at 25°C over the period of 24 days (Table 1). Menthol volatilization from entrapment in SilaFresh additive is slower than from natural sponge. Assuming volatilization follows first order kinetics, the rate constant for menthol volatilization from SilaFresh additive is 3.7-3.9 times reduced compared to beads and natural sponge. After 24 days, the relative amount of menthol being released into the headspace is 47 times greater from SilaFresh additive than natural sponge, potentially indicating a greater reservoir of odorant is still available.

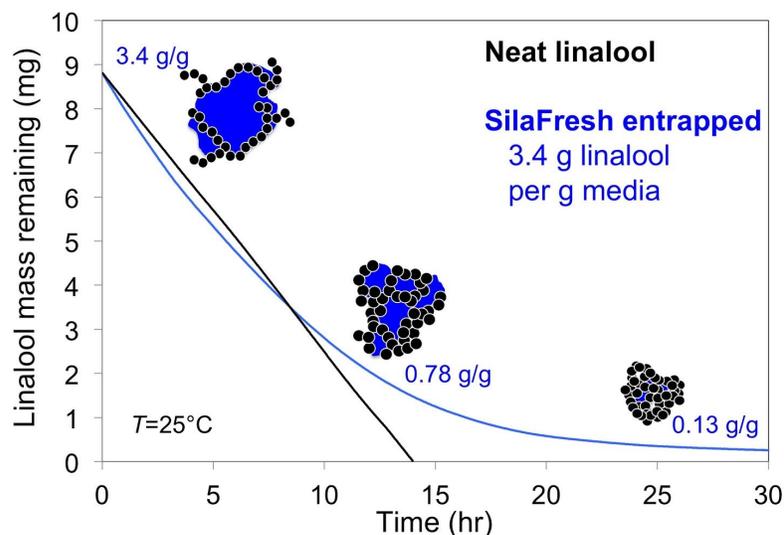
**Table 1:** Vapor Phase Concentrations of Semi-Volatile as Measured by Headspace GC-MS

Encapsulant	Relative Vapor Phase Concentration After 24 Days		
	Hexanol	Dodecane	Menthol
Control	1.8	1.4	1.4
Natural Sponge	1.0	1.0	1.0
SilaFresh™ Additive	5085	11.4	47.5

## How can SilaFresh Additive be used for fragrance products?

- Direct addition to non-aqueous liquid formulations to sequester fragrances upon solvent evaporation.
- Dry formulations: SilaFresh particles still feels dry even when loaded with liquid fragrances.

**Example: Extended Delivery of Linalool.** The release of linalool, a light note fragrance, over a 30 hr period was measured (Figure 1). Initially, the evaporation rate of linalool entrapped in SilaFresh additive was such that the release was slightly greater than neat linalool. As the linalool was released, the pores of SilaFresh additive constricted slowing the release rate to a near steady state. Linalool continues to be released over a 48 hr period. In contrast, un-encapsulated linalool was depleted in 12 hr. In typical fragrance formulations linalool is fully evaporated in less than 1 hr.



**Figure 1:** Mass of linalool remaining after application using neat linalool vs. SilaFresh entrapped linalool.

## Malodor Adsorption

SilaFresh additive can also capture malodors, even when loaded with fragrances.

## Summary

ABS Materials has developed a unique material that can greatly improve many products in personal care and home care. SilaFresh additive can be loaded with fragrances and other active ingredients at a high capacity. The pore structure of the SilaFresh additive results in an extended and balanced release of fragrances and active ingredients. SilaFresh additive can be incorporated into various formulations, including ethanolic formulations and detergents of high surfactant level.

## Patent Portfolio



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ABS Materials has 11 granted patents including composition of matter and applications such as personal care. Several key patents have been filed internationally including EU, Japan, China, Australia, Korea, Canada, Mexico, Brazil, India. The company also has 6 pending patents relevant to personal and home care applications. To date, there has been no limitations on field of use in personal care and home care.

#### **Granted**

7,790,830	Swellable sol-gels, methods of making, and use
8,367,793	Swellable materials and methods of use.
8,119,759	Swellable sol-gels, methods of making, and use thereof
8,217,131	Method for extracting a metal particulate from an aqueous solution...
8,563,649	Method of treating a material using a sol-gel derived composition
8,703,895	In-situ method and system for controlling the flow...
8,754,182	Sol-gel derived sorbent material containing a sorbate interactive material...
8,921,504	Method for removing ionic species contained in an aqueous phase...
14/481,077	Method for removing ionic species contained in an aqueous phase...
EP2601127	Method and system for applying force against a solid object...
14/156,326	Sorbent material and method for using the same.

#### **Contact Information**

For additional information regarding SilaFresh additive, please email [info@absmaterials.com](mailto:info@absmaterials.com).