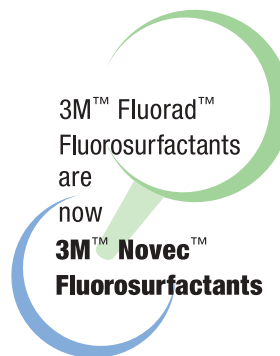




Novec™ Fluorosurfactant FC-4432

Product Information



Introduction

3M™ Novec™ Fluorosurfactant FC-4432 is a non-ionic polymeric fluorochemical surfactant belonging to a class of coating additives which provide low surface tensions in organic coating systems that are best obtainable with fluorochemicals. Novec FC-4432 fluorosurfactant is an excellent wetting, leveling and flow control agent for a variety of water-borne, solvent-borne, high solids, and radiation curable organic polymer coating systems. Novec FC-4432 fluorosurfactant is soluble and compatible with most polymers and continues to be active throughout the drying or curing process. When used in water-borne polymer systems, Novec FC-4432 fluorosurfactant tends to reduce the aqueous/organic interfacial tension and remain surface active in the organic portion of the polymer system.

Novec FC-4432 fluorosurfactant is the first in a new line of fluorochemical surfactants from 3M based on perfluorobutane sulfonate (PFBS). PFBS refers collectively to perfluorobutane sulfonyl compounds including perfluorobutane sulfonates. 3M believes PFBS-based surfactants, with only four perfluorinated carbon atoms, offer improved environmental properties.

PFBS EHS Summary

- Low toxicity
 - Low mammalian toxicity
 - Low ecotoxicity
- Bioconcentration factor <1

Typical Physical Properties

Not for specification purposes

All values determined at 77°F (25°C) unless otherwise specified

Properties	FC-4432
Appearance	Slightly hazy/clear, yellow viscous liquid
Specific gravity	1.21
Flash point (Setaflash closed cup)	180°F (82°C)
pH (of 1% aqueous solution)	4.5
Boiling point	392°F (200°C)
Vapor pressure	0.0014 psi (0.07mm Hg)
Viscosity (Brookfield, #3, 6 rpm)	4000-6000 cps
Solubility in water	Slight, dispersable in all proportions
Tg	15-20°C
Type	Non-ionic
Composition	87% polymeric fluorochemical actives 7% non-fluorochemical actives 5% 1-methyl-2-pyrudidinone <1% toluene
Freeze/thaw stability	Protect from freezing*

*If material freezes, warm it to >30°C until fluid. Freezing will not change physical properties or adversely affect performance.

3M™ Novec™ Fluorosurfactant FC-4432 Use Recommendations

Recommended use level is between 0.05% and 0.3% active surfactant; however, use level can vary depending on the use and concentration of other additives and solvents in the formulation. Novec FC-4432 fluorosurfactant is effective in water-borne systems. It is suggested, however, that a 10-25% active surfactant solution be prepared with water-miscible solvent prior to addition. Recommended solvents include dipropylene glycol mono methyl ether (DPM), isopropyl alcohol, butyl cellosolve or other water-miscible solvents common to coating systems.

FC-4432 Static Surface Tensions in Organic Solvents/Systems

All values determined at 77°F (25°C) unless otherwise specified

Solvent	Grams of FC-4432 / 100 ml of solvent			
	0.0	0.1	0.2	0.5
Distilled Water	72	21	20	20
Methyl Alcohol	23	22	22	21
Cellosolve Acetate	29	27	26	25
Butyl Cellosolve	28	26	25	24
Butyl Carbitol	30	26	25	24
Methyl Ethyl Ketone	25	24	24	24
Toluene	28	25	24	23
Dimethylformamide	33	27	25	24
Polyethylene Triol LG-56	33	27	23	18
UVR-6110	46	26	21	21
Epon Resin 828-RS	45	16	15	13

Interfacial Surface Tensions

Surfactant	Interfacial Tension (dynes/cm) Light Phase: Heptane			Interfacial Tension (dynes/cm) Light Phase: Cyclohexane		
	200ppm	0.5%	1.0%	200ppm	0.5%	1.0%
	Control		43.7			51.2
FC-4432	4.2	2.6		4.2	2.1	
FC-430	3.5	2.4		4.0	2.1	
SDS ¹	15.4	6.1	5.8	12.9	5.0	4.9
SDS-10 ²	15.9	4.1	3.7	13.5	2.9	2.6
Silicone Dispersant	14.4	10.9	10.5	11.7	8.8	8.8

¹Sodium dodecyl sulfate

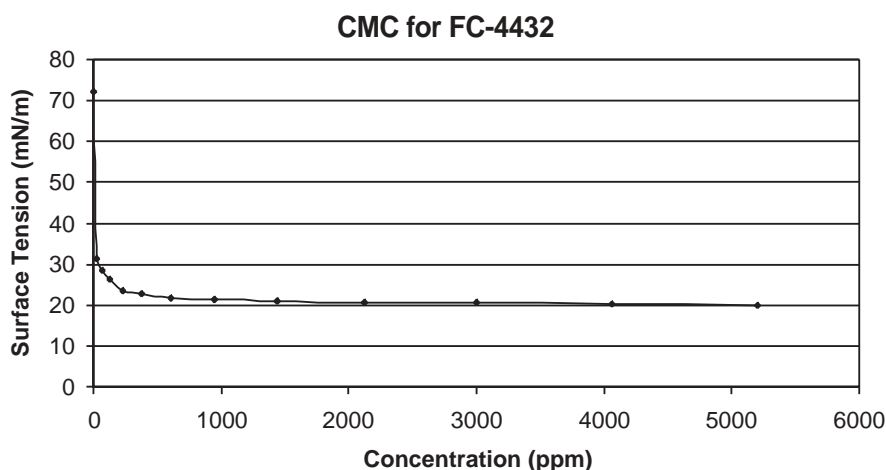
²Sodium dodecyl benzene sulfonate

FC-4432 Solubility

All values determined at 77°F (25°C) unless otherwise specified

Solvent	Grams of FC-4432 / 100 ml of solvent
Methyl Alcohol	>25
Butyl Cellosolve	>25
Cellosolve Acetate	>35
Cellosolve	>25
Methyl Ethyl Ketone	>25
Toluene	>35
Dimethylformamide	>25
Polyethylene Triol LG-56	>40
Phenyl Glycidyl Ether	>30
Dibutyl Phthalate	>25
Heptane	<1
Mineral Spirits	<1

3M™ Novec™ Fluorosurfactant FC-4432 Surface Tension/CMC (in water)



TGA data for Novec FC-4432

This data shows the excellent thermal stability of FC-4432 fluorosurfactant if used in a thermal processing application.

(10 mg sample heated at 5 °C / min. in air)

Temperatures (°C) at which specified % wt. loss occur

	5%	10%	50%	80%	90%	95%
FC-4432	195	255	305	330	355	405

FC-4432 Static Surface Tensions in Aqueous-Borne Resins

Resin	Control	HC Surfactant			Competitive FC Surfactant	Silicone Surfactant
		1.00%	0.3%	0.3%		
NeoCryl A-550	36.7	27.2	29.6	22.3	26.8	24.6
NeoCryl A-6099	39.1	29.0	24.3	20.1	26.1	27.3
NeoRez R-941	43.1	29.8	21.2	19.9	24.4	23.8
NeoRez R-9621	47.4	33.1	21.2	20.4	24.2	22.8
JONCRYL 537	37.4	31.8	19.7	21.0	25.6	27.6
JONCRYL 1532	38.4	32.9	21.2	23.4	26.9	28.9
JONCRYL 1925	41.0	31.2	19.7	20.2	25.4	27.1
JONCRYL 1972	38.9	27.6	22.4	21.9	26.3	27.6

Regulatory Summary

- Not considered persistent, bioaccumulative and toxic (PBT) under the U.S. Environmental Protection Agency's (EPA) PBT Chemical Policy
- The first series of PFBS-based surfactants produced by 3M have been reviewed by the U.S. EPA and placed on the TSCA inventory. There is a testing consent order in place. The products are exempt from reporting in Europe because they meet the polymer exemption criteria and, in addition, all monomers are on the European chemical inventory (EINECS). The products are available for purchase in Australia, China, Korea, New Zealand and on a limited basis in Canada and Japan. FC-4432 is not compliant with the Philippines regulatory agency. Please see MSDS for most recent regulatory listing.
- PFBS and PFBS-based surfactants are not included in the U.S. EPA's PFAS Final Significant New Use Rule (SNUR 67FR 72584).

For additional country specific information, please contact 3M's Chemical Regulatory department: jfschulz@mmm.com

3M™ Novec™ Fluorosurfactant FC-4432 Packaging and Availability

Novec FC-4432 fluorosurfactant is currently available in:

- 8 lb. pail
- 40 lb. pail
- 250 lb. drum

For additional literature, MSDS or to request a 2 oz sample, visit our website:
www.3m.com/paintsandcoatings.

FC-4432 Product Safety and Handling

3M™ Novec™ Fluorosurfactant FC-4432 is intended for use in contained and non-dispersive applications.

3M does not recommend this product for use in applications involving repeated exposure through skin contact, inhalation, or ingestion. It is not intended for cosmetic or medical usage. Neither 3M nor the Food and Drug Administration has evaluated or reviewed this product for food or pharmaceutical applications.

It is the buyer's responsibility to determine whether this product is durable and properly cured for the end use. This will help minimize environmental impact by ensuring the coating is not easily removed nor disposed to a waste water treatment facility. Incinerate in an industrial or commercial facility in the presence of a combustible material. Combustion products will include HF. Facility must be capable of handling halogenated materials. As a disposal alternative, dispose of waste product in a facility permitted to accept chemical waste. For further information, see the product Material Safety Data sheet.

3M Resources

To place an order or to request additional information, please contact your local 3M representative, an authorized 3M distributor or call 1 800 541 6752.

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