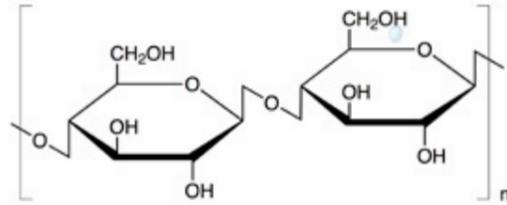


# Betafib® MCF, a novel and patented structurant for numerous applications with unequalled properties

## Introduction

This part of our documentation covers extra information on possible applications and consequent benefits of the unique material Betafib® MCF. We will address

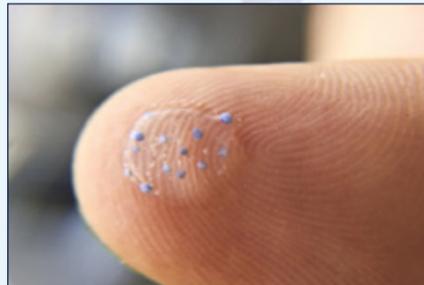
- A. Versatility
- B. Compatibility
- C. Added value



## Broad window of application

Obviously the added value of Betafib® MCF is closely related to its versatility and compatibility. The latter one has been observed by extensive testing in water-containing formulations in various application areas. Please find an extract of the range of our testing for added value next to Personal Care or Home Care | I&I applications.

- Building and construction e.g. adhesives and mortars to improve application ease
- Concrete e.g. to prevent stratification
- Paper and cardboard e.g. to increase strength or improve printability
- Resins e.g. to maintain homogeneous slurries
- Paints and coatings e.g. to improve anti sag a/o to prevent cracking
- Composites e.g. to improve strength
- Food e.g. to stabilize emulsions or bake proof jellies
- Superabsorbents e.g. to fixate the material to the underground
- Wet wipes e.g. to create homogeneous deposition
- De-icing and anti-icing e.g. to improve storage stability
- Windscreen cleaner, e.g. for homogeneous wetting and rinsability
- Inks a/o toners e.g. to prevent sagging/settling in the cartridge
- Pesticides e.g. to control undesirable leaching



In all fields mentioned it was possible to incorporate Betafib® MCF in the typical formulations used. This leads to the statement that this material is highly compatible given the broad range of applications and the consequent vast amount of ingredients that is being used. Therefore we feel that Betafib® can offer USP's in a very broad range of applications, stretching even far beyond the ones mentioned.

## Particle carrying properties also under challenging conditions

Typically the main reason to investigate the possible use of Betafib® MCF originates in the particle carrying properties of this unique material whilst remaining to show a shear-thinning character. Unique since it forms a physical network in a fluid. The physical presence of the Betafib® material results in the capacity to carry (also large amounts of) particles. These particles can be of all sorts and sizes; we even demonstrated the capability to carry nylon bearings in a watery fluid. Due to the inert nature of cellulose and as an outcome of the Cosun patented processing route, Betafib® MCF upholds its performance in various formulations and under challenging conditions e.g.

- Over a wide pH range (starting at approx. 1.5 and extending to at least 13) and
- At temperatures up to 180 °C\* (356 °F) whilst unaffected by
- In the presence of electrolytes up to heavy brines (> 40%)  
\* this maximum temperature applies to watery systems. When applied in brines this temperature is significantly higher depending on composition

## Personal Care and HomeCare benefits

When zooming in on these categories, a large playing field opens up where Betafib® MCF could be of added value.

In order to get more detailed information on applications where Betafib® could add value, following inventory was set up.



Expected benefit on the use of Betafib® MCF
Soil release
Suspension of active materials (e.g. encaps, beads, abrasives, anti-dandruff)
Vertical cling
Foam stability
Skin feel
Ease of dosing / general rheology (e.g. flow pattern through orifice or nozzle or ease of pouring out of bottles w/o orifice)
Rinsability
Emulsion stability
Stabilization of slurries (homogeneous)
Mattifying effect

Out of the benefits mentioned, an overview was generated on possible categories. Please find below a first listing of applicable products.

Household Care		
Product	Variant	Benefit
Hand dish wash liquid		General rheology, suspensions of actives
Auto dish wash liquid		Suspension of actives (encapsulated bleach or enzymes)
General purpose cleaner	Liquid	General rheology, suspension of actives, soil release
	Spray	Vertical cling, rinsability
Abrasives	Liquid	Stability of suspension, rinsability
Bathroom cleaner	Liquid	General rheology, suspension of actives, soil release
	Spray	Vertical cling, rinsability
	Acidic	Stability/shelflife
Kitchen cleaner	Liquid	General rheology, suspension of actives, soil release
	Spray	(vertical) cling, improved spray pattern [oven cleaners]
	High pH	Improved spray pattern
Toilet bowl cleaner*	Bleach/HCl	Stability/shelf life, vertical cling, rinsability
	Daily	Vertical cling, rinsability
Floor cleaner	Liquid	General rheology, suspension of actives, soil release
Wipes		Homogeneous slurries for impregnation of wipes
Drain openers		Vertical cling on plastics, rinsability
Limestone removers	Acidic	(vertical) cling, rinsability, stability

\*see separate documentation



Personal Care		
Product	Variant	Benefit
Skin care	O/w & w/o face-cream	General rheology, skin feel, mattifying effect, emulsion stability
	Serum	
	Body lotion	
Bath & shower	Face cleanser	General rheology, suspension of actives (beads), skin feel, rinsability
	Shower gel	
	Scrubs/exfoliants	
	Foam	Foam stability
	Low pH cleanser	General rheology, stability
	Make up remover	
Hair care	Shampoo	General rheology, suspension of actives (e.g. pearlizer, anti-dandruff)
Sun care	Sun screen	General rheology, stabilizing UV filters
	After sun	General rheology, suspension of actives
Sanitizing gel		General rheology
Colour cosmetics	Mascara	General rheology, suspension of actives
Men's grooming	Shaving gel	General rheology, skin feel, foam stability
	Shaving soap	Skin feel, foam stability
Oral care	Toothpaste	General rheology
	Mouth wash	Stability, cling, rinsability



Fabric Care		
Product	Variant	Benefit
Liquid detergent		General rheology, suspension of encapsulated actives, soil release
Fabric conditioner	Liquid/capsule	General rheology, suspension of actives (encaps), stability/shelf life of the emulsion

For indicative testing a total of 18 formulations were prepared. The formulations represent medium to high performance fluids. Details on compositions can be shared upon request. We have chosen to assess the benefits of Betafib® MCF, possibly only coarsly, with regards to bathroom spray, kitchen cleaner, scouring cream, toilet bowl cleaner, toilet bowl bleach, drain cleaner, hand dish wash, liquid laundry detergent, fabric softener, shampoo, shower gel, cleansing scrub, cleansing lotion, shaving gel, toothpaste, skin crème, body lotion and sunscreen.

In a variety of formulations, many ingredients are being used: all kinds of surfactants, actives and particles. Various formulations offer a broad pH range where some of those are very loaden. Nevertheless Betafib® MCF was incorporated in all of them without too much of a hassle. Therefore it feels just to state that this exceptional structurant is highly compatible for use in the categories tested. This is totally in line with testing done in other fields then mentioned above.

Two benefits that are closely related were confirmed as well: all formulations that were tested for vertical cling performed well. And the rinsability proved to be very good as well.

Betafib® MCF is capable of stabilizing foams. The gas bubbles are being captured in the physical Betafib® structure.

The test panel judged the skin feel of personal care products containing Betafib® MCF as positive. Formulations containing the fibre/platelet structurant showed to be very well applicable i.e. easily to distribute during application. The test panel was also very pleased with the organoleptic properties of the skin care formulations.

Due to the rheology that Betafib® MCF offers, with particle carrying properties at low/no shear conditions whilst remaining its shear thinning character, the easy of dosing and ease of use were rated good for the formulations tested.

Typical levels of usage range from approx. 0.15 to 1.0% as expressed in 100% dry matter on the total mass of the formulation being structured.

Betafib® MCF relates to international patent applications WO2014017913, WO2014017912 and WO2014142651.

### Ecotox profile

Betafib® MCF is processed out of agricultural streams containing parenchymal cell wall material.

The cellulose is extracted and purified through a Cosun patented process. During this process no modification takes places thereby resulting in a all natural ingredient.

Please find below some details on our Ecotox data, showing an optimal fit e.g. for use in Personal Care a/o Home Care applications.

Test protocol/method	Purpose	Result
GC-MS	Presence of 26 allergenic fragrance compounds	None detected above limits of quantification
OECD 201	Toxicity towards algae	Recoveries ≥80% of initial concentrations after 72 hrs
OECD 202	Acute toxicity towards daphnia	Recoveries > 80% of initial concentrations after 48 hrs
OECD 203	Acute toxicity towards zebra fish	No toxic effects observed
OECD 302C	Biodegradability	Inherently biodegradable since ≥ 87% degradation after 28 days N.B. No toxicity towards microflora since absolute oxygen demand equaled control substance
OECD 423	Acute oral toxicity on rats	LD <sub>50</sub> > 2000 mg/kg body weight No signs of toxicity
OECD 437	Eye damage	Not serious eye damaging (Cat. 1)

**Do you want to find out how Betafib® MCF can add value to your current formulations or are you facing a challenge in structuring your formulations?**

**Chances are that Betafib® MCF as the new kid on the rheology block, could facilitate your leap forward!**

**Then you are one step closer to progressing: contact us by mail or phone to move your project ahead.**

Please contact us through [www.cosunbiobased.com](http://www.cosunbiobased.com) or direct through [sales@cosunbiobased.com](mailto:sales@cosunbiobased.com)