



Fibers for Life.

Fibers and Hydrocolloids for Construction Chemical Products

ARBOCEL® LIGNOCEL®



A young girl with long brown hair, wearing a white lace-trimmed shirt, is smiling broadly in a field of tall grass. A person's hand is visible in the foreground, reaching towards her. The scene is bathed in warm, golden light, suggesting a sunset or sunrise. In the top left corner, there is a logo consisting of a blue square, a green circle, and a yellow circle.

*„A Better Tomorrow
With Every Fiber“*

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Disclaimer

The following information is based on our practical knowledge and experience and is meant to be helpful when using our products. Due to the different materials and processes involved, we recommend in any case, adequate testing at your company or consultation with us. We cannot be held liable for this information.

JRS – The Plant Fiber Company

Manufacturer and global industry partner

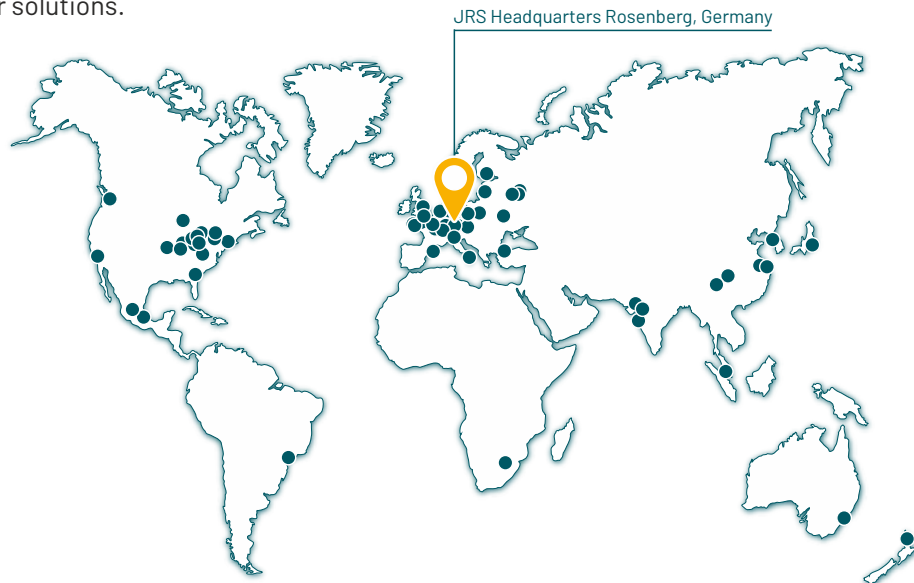
JRS is an owner-managed group of companies with headquarters in southern Germany and an international production and distribution network.

We are pioneers in the Plant Fiber Technology. Our fiber people are your competent and reliable partners in the construction chemical industry. In addition, we also serve industries such as pharmaceuticals, the food industry and road construction. Since many decades, we are writing history with our functional and sustainable plant fiber solutions.

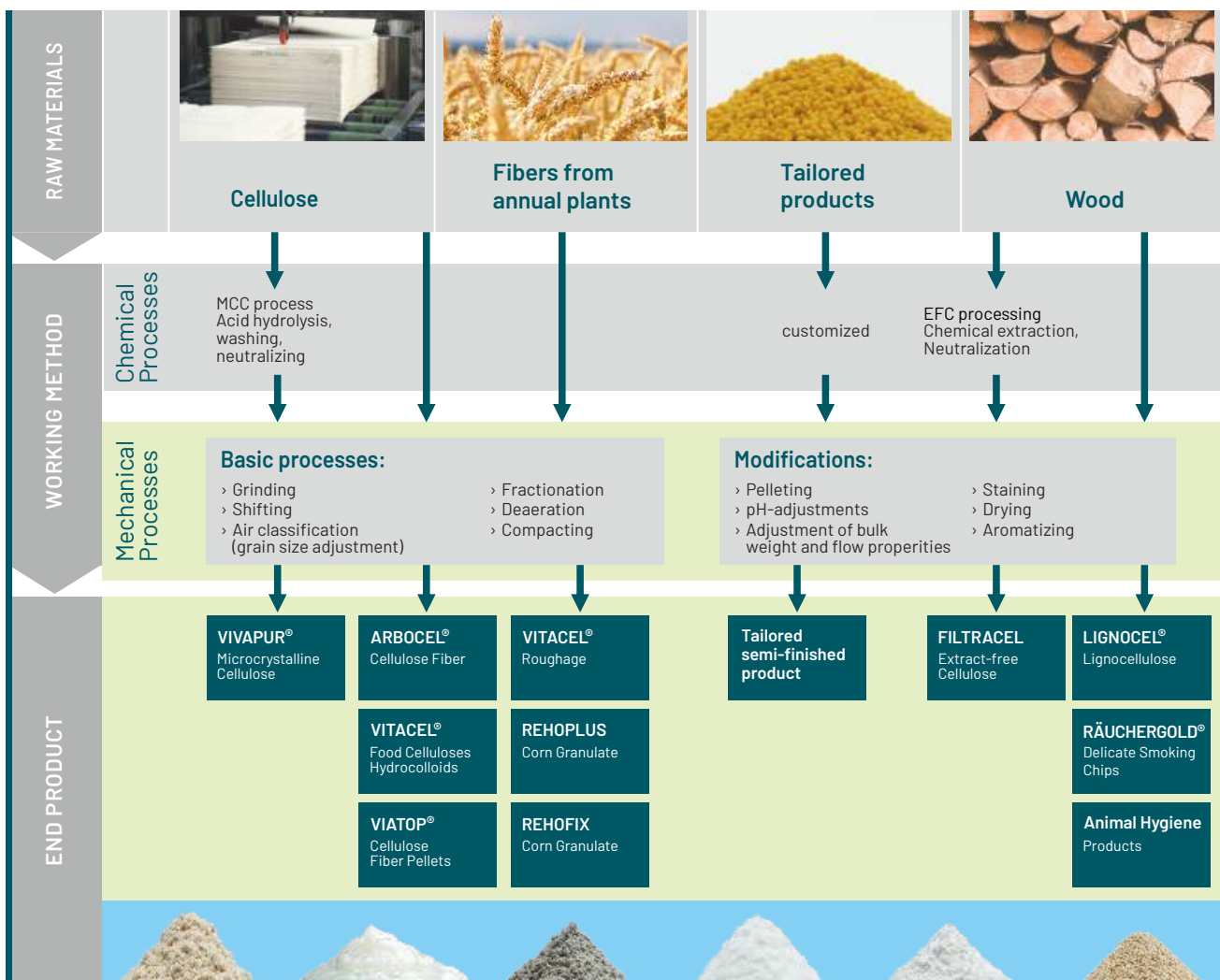
Your Service Partner in

- > Product development
- > Formulation adjustment
- > Application support

Your technology and service partner all over the world



JRS core competence



JRS in Construction Chemistry

Competence in construction chemistry

Development / Application Technology

Our aim is to respond flexible to market demands and develop innovative products that excel in your applications. We can offer you the following services:

- > Reformulation and technical support
- > Standard tests
- > Application tests



Slipping test for cement tile adhesive

Process / Production Technology

We know that for you, conveyor technology, mixer technology and metering equipment are important components to ensure smooth production.

For more details please look at page 22.



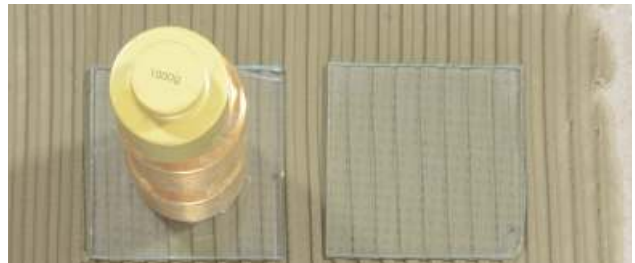
Test equipment for cement tile adhesive

Experience / Expertise

JRS has been supplying innovative ARBOCEL® cellulose fibers to manufacturers of construction chemical products worldwide for over 40 years.

Make use of our success and experience.

We are looking forward to helping you with your technical requests.



Wettability test for cement tile adhesive



Products applied in construction chemistry

Cellulose Fibers and Modified Cellulose Fibers

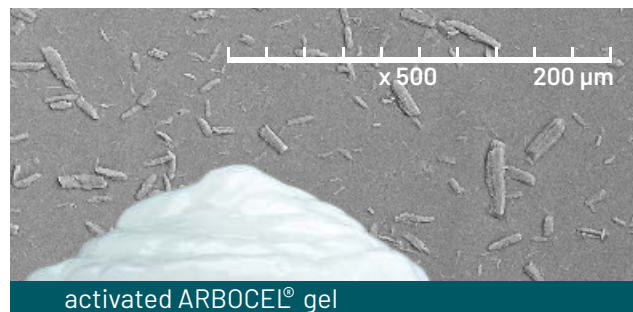
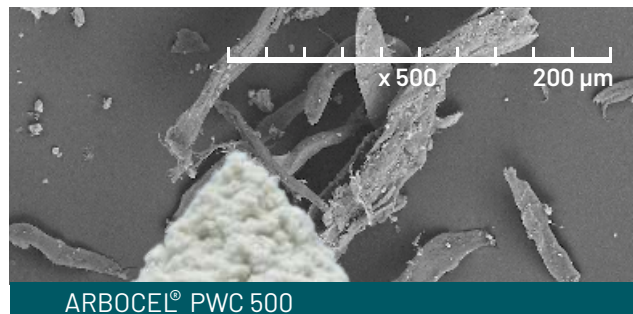
Main applications

- > Stuccos / plasters / 3D mortars
- > Tile adhesives
- > Joint fillers for plasterboards
- > Emulsion paints
- > Bituminous products
- > Adhesive and reinforcing compounds for composite thermal insulation systems
- > Joint fillers / filler compounds / refractory compounds

Cellulose Gels / JRS Hydrocolloids

Main applications

- > Water-based ready-to-use systems (paints, plasters, etc.)





ARBOCEL®

Natural Cellulose Fibers

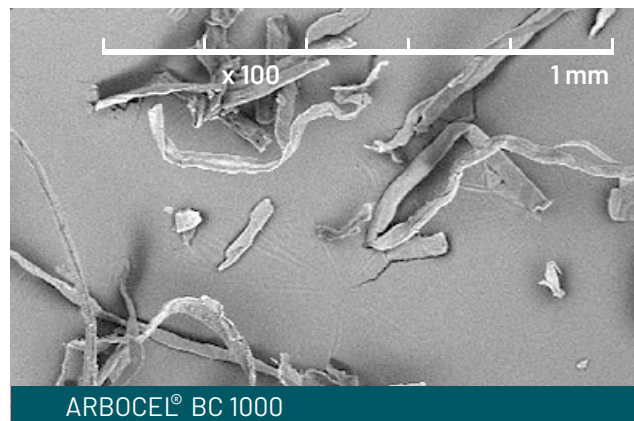
What is ARBOCEL® ?

ARBOCEL® is a powdery to fibrous cellulose additive for use in construction chemical products.

ARBOCEL® additives are produced from cellulose. A whole range of renewable raw materials is available for producing cellulose.

ARBOCEL® are water-insoluble celluloses left in their natural state (not comparable to water-soluble cellulose ethers).

ARBOCEL® is produced in various qualities (fiber lengths, thicknesses, purities, etc.) for a very wide range of industrial applications.



ARBOCEL® BC 1000

Properties of ARBOCEL® Cellulose Fibers

- › From the finest grades with a mean fiber length of 8 µm to the longest fiber grades with a mean fiber length of 2000 µm.
- › The long-fiber grades have a “felting” effect due to the curved structure. It is also due to this structure that ARBOCEL® has a better reinforcing behavior compared to short-cut synthetic fibers.
- › Approx. density 1.5 g / cm³.
- › Insoluble in water and organic solvents.
- › Stable from pH 4 - 12.
- › The steady-state moisture content of ARBOCEL® cellulose fibers is approx. 10 - 12 %. ARBOCEL® is normally supplied with a moisture content in the range of 4 - 8 %. In this form ARBOCEL® cellulose is slightly hygroscopic (water-absorbing). Therefore we recommend to store ARBOCEL® in a dry place.
- › Guide values for temperature exposure:
 - 160 °C for several days
 - 180 °C for approx. 1 day
 - 200 °C is the limit of thermal exposure

- › Water that penetrates into the fiber capillaries reaches the freezing point at approx. -70 °C. As a result of the formation of hydrogen bridge bonds between cellulose and water, the structure of the water is modified in such a way that the water is more compact at low temperatures than in liquid form. In practice this means complete frost protection of ARBOCEL® fibers (no bursting effect possible as with ice).

ARBOCEL® cellulose fibers are also used as an asbestos substitute. Usually 30 - 50 % of the weight of asbestos previously used is sufficient.

- › Completely safe and therefore suitable as substitute for asbestos in many applications.

What are JRS Hydrocolloids?

JRS hydrocolloids are dry powders or granules for easy handling, which develop their functionality and benefits after activation in water-based systems.

Main functionalities are thickening effects, adjustment of rheological behaviors, gel formation, surface activity, reduced syneresis, stabilizer, etc.

JRS hydrocolloids are based on natural, regrowing raw materials such as celluloses, fruits and algae.

Depending on our customers demand we offer a broad portfolio of different hydrocolloids (HPMC, MCG, Alginates, etc.).

How to Activate the Gel (MCG)

Activation of e.g. 3 % fiber gel in water with dissolver.

1.

Add the ARBOCEL® powder slowly at low shear force to the water (e.g. with 1.1 m / sec.)



2.

Mixing for approx. 3 minutes at high shear force (e.g. with 7 m / sec.)



3.

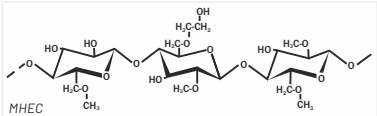
Activated ARBOCEL® gel
Please control the viscosity



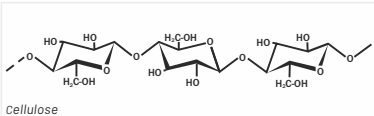
Comparison of Cellulose Ethers Versus ARBOCEL® Fibers

Differences to Cellulose Ethers

	Cellulose ether	ARBOCEL® fiber
Water soluble	yes	no
Stickiness	yes	no
Water retention	yes	yes
Example: Centrifugal method AACC ¹⁾	> 2000 %	BE 600/30 PU approx. 350 % BWW 40 approx. 580 % BC 1000 approx. 1000 %
Viscosity increase	yes	yes, but less compared to high viscosity cellulose ethers



MHEC



Cellulose

1) AACC = American Association of Cereal Chemists

Water retention (%) = (weight of wet cellulose - weight of cellulose) / weight of cellulose fiber x 100

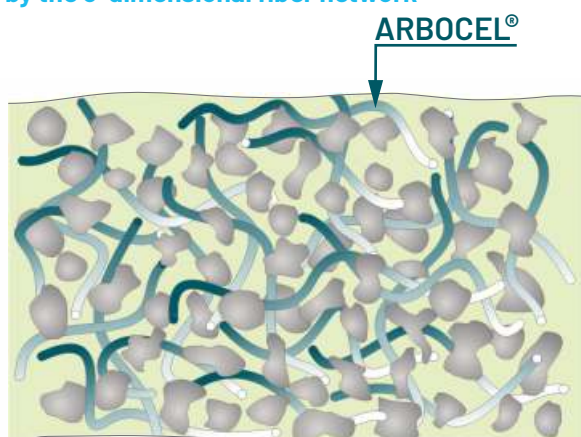
ARBOCEL® in Construction Chemical Products and Bituminous Products

(mineral or emulsion-bound)

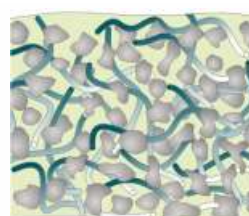
Why is ARBOCEL® Used?

1. to reinforce dry mortars
2. to improve the workability
3. to reduce sagging
4. to reduce shrinkage
5. to reduce micro cracks / improve scrub cycles
6. to prolong the open time
7. to reduce dust
8. to reduce syneresis

1. to reinforce dry mortars by the 3-dimensional fiber network

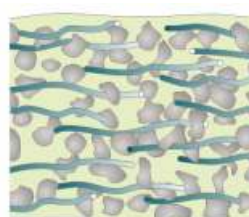


2. to improve the workability because of the structural viscous behavior



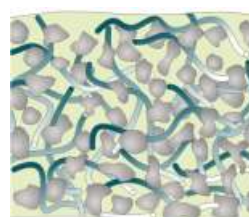
System at rest

Fiber structure created by ARBOCEL®



System in motion

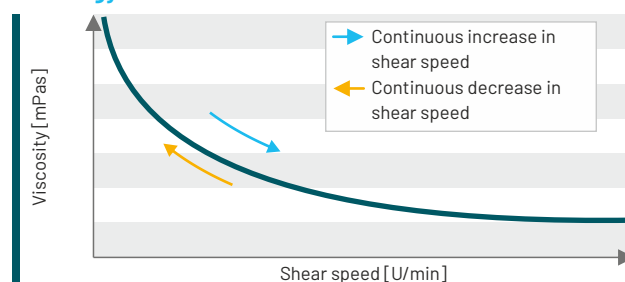
- > Collapsed fiber structure
- > Fibers align in the flow direction
- > Fibers release some of the liquid into the matrix
- > Decrease of viscosity



System at rest

As soon as shear forces stop acting on the system, the state shown in the first figure is restored.

Rheology



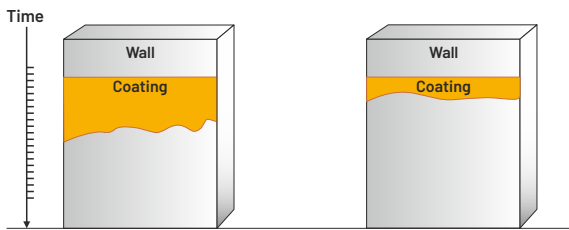
Pseudoplastic or structural viscous behavior of ARBOCEL®

3. to reduce sagging by the reinforcement

Use in vertical coating

Without ARBOCEL®

With ARBOCEL®



Without ARBOCEL®

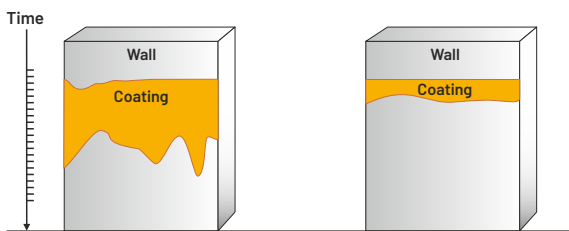
With ARBOCEL®



ARBOCEL® cellulose fibers form a 3-dimensional network with cross-linking effect. The greater the average fiber length, the greater is the reinforcing and anti-sagging effect.

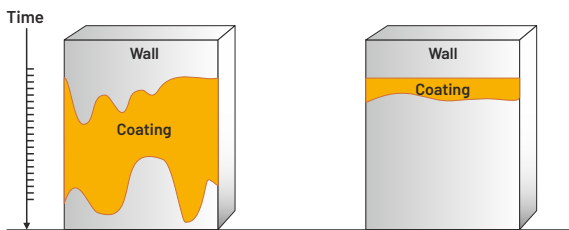
Without ARBOCEL®

With ARBOCEL®

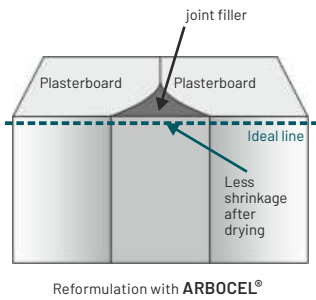
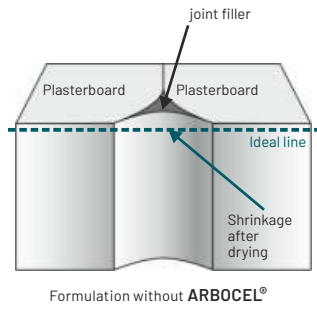


Without ARBOCEL®

With ARBOCEL®

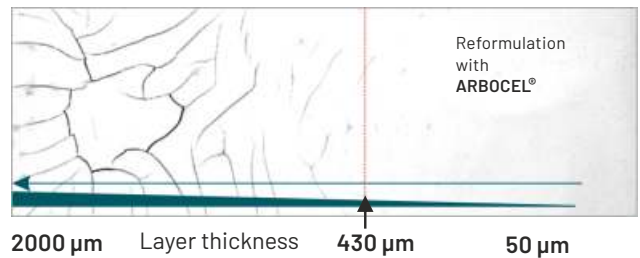
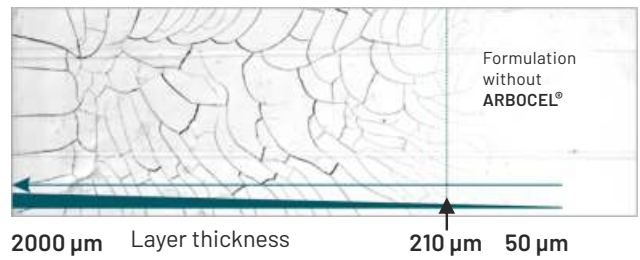


4. to reduce shrinkage due to the reinforcing fibers



5. to reduce micro cracks / improve scrub cycles

Crack inhibitor shown on an emulsion paint



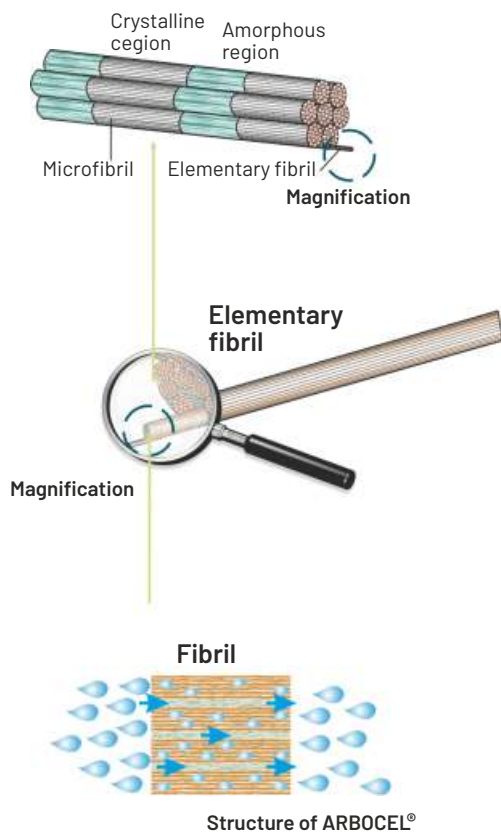
ARBOCEL® reduces some of the mechanical energy



6. to prolong the open time

because liquid is transported by the cellulose fibers from inside (core) to the surface, where evaporation takes place

a) Capillary effect due to the fiber structure

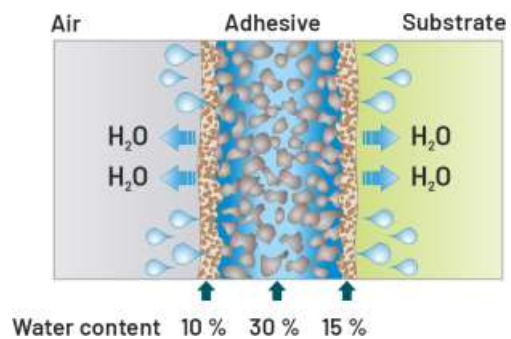


Fibril can absorb and release liquids.

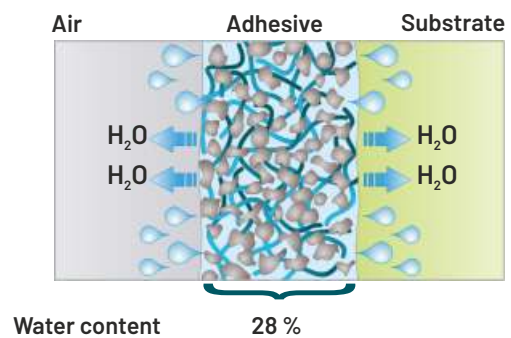
b) Function of ARBOCEL® in the coating

Open time / tendency to form skin with and without ARBOCEL®

Adhesive with water retaining agent, approx. 20 minutes after application



Adhesive with water retaining agent and ARBOCEL® approx. 20 minutes after application



Note: The above values (e.g. 20 minutes) are intended only to demonstrate the effects of ARBOCEL®

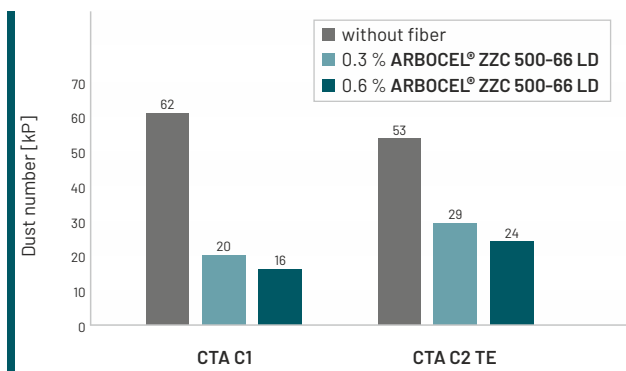
**7. to reduce dust
by using ARBOCEL® LD (Low Dust) fibers for dry mortar products**



Dry mortar without ARBOCEL® LD

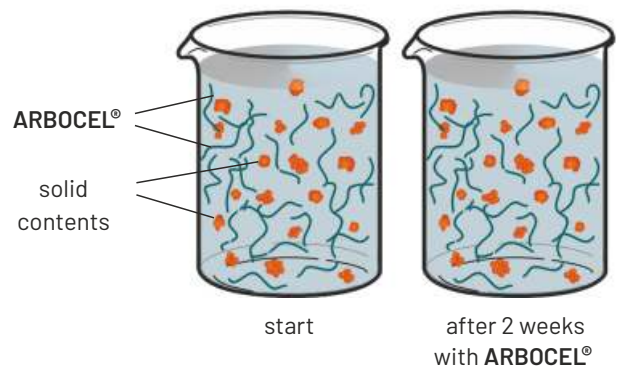
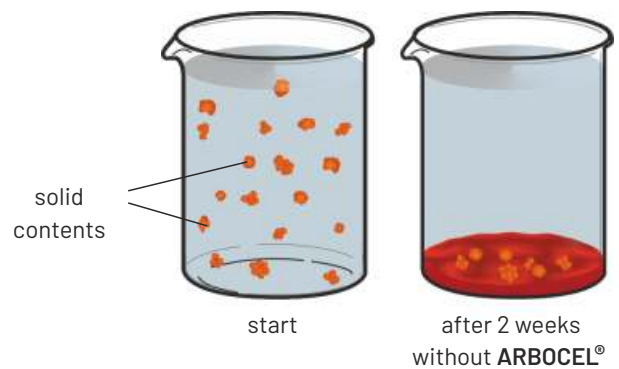


Dry mortar with
0.4 % ARBOCEL® ZCC 500-66 LD



ARBOCEL® ZCC 500-66 LD

**8. to reduce syneresis
in ready-to-use systems with JRS hydrocolloids**



ARBOCEL® Selection Criteria

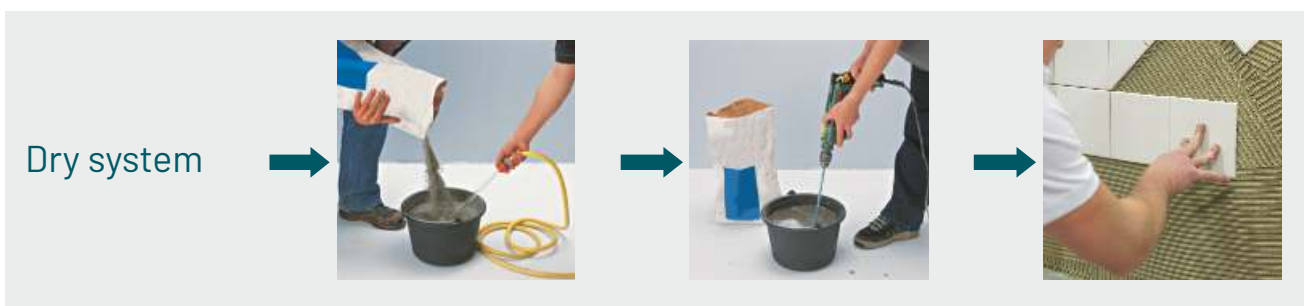
The Most Suitable ARBOCEL® Grade Depends on

- › The required profile of the finished product (e.g. surface, color, etc.)
- › Type of mixer (dry system or ready-to-use system)
- › Application of the product (airless, brush, etc.)
- › Metering requirements

General Correlation: Fiber Length / Effectiveness / Mixing Behavior

ARBOCEL® type	Average fiber length	Effective-ness	Mixing behavior*	
			in dry mixtures	in aqueous systems
BE 600/30 PU	short ø 40 µm	low	very good	very good
BWW 40	medium ø 200 µm	good	good	very good
B 400	long ø 900 µm	very good	not recommended	good

* If you have any difficulties blending ARBOCEL® we will be happy to help you.



Main and Modified JRS Qualities

Main qualities

		ARBOCEL®	ARBOCEL®	ARBOCEL®	ARBOCEL®	ARBOCEL®	ARBOCEL®	
Brand name		ARBOCEL®	ARBOCEL®	ARBOCEL®	ARBOCEL®	ARBOCEL®	ARBOCEL®	
Grade		UFC M8	BE 600/30 PU	B 00	BWW 40	BC 1000	B 400	
Color		white	white	white	white	white	white	
Raw material		Cellulose	Cellulose	Cellulose	Cellulose	Cellulose	Cellulose	
Average fiber length [µm]		6 - 12 (d50)	40	120	200	700	900	
Average bulk density [g/l]		190	220	168	138	45	30	
Binders	e.g. cement, gypsum, lime	Mineral plasters / 3D mortars						
		Joint fillers for plasterboards / skim coats						
		Mineral tile adhesives						
		Construction adhesives / adhesives for EIFS						
		Extruded cement products (like profiles, range spacer)						
		Refractory compounds						
	Synthetic resin	Emulsion paints / coatings						
		Acrylic roof coating						
		Emulsion-bound finish plasters						
		Joint fillers for plasterboards / filler compounds / emulsion tile adhesives						
	Bitumen	Bitumen foils / waterproofing membranes						
		Cold bitumen applications						

* It's also possible to produce LD based on white or off-white ARBOCEL® grades

Preferred JRS grades



For special applications / functions we have also different hydrocolloids (Alginate, HPMC, MCG, etc.) and other natural fibers like Sisal.

Please contact us for further details.



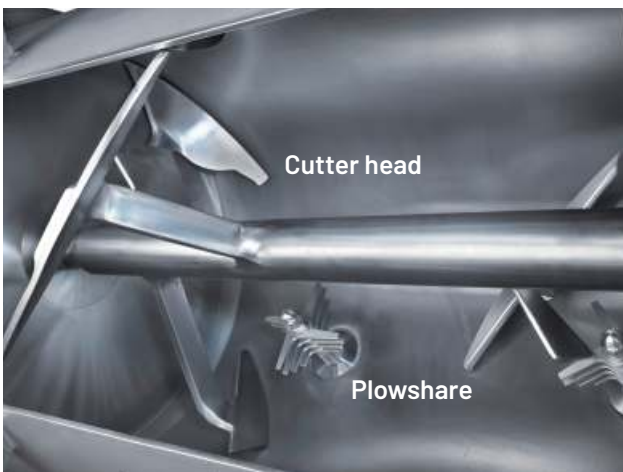
Mineral / Dry Systems

ARBOCEL® Grades Used

Brand name	Ø Fiber length	Color
ARBOCEL® FD 40	250	off-white
ARBOCEL® PWC 500	500	off-white
ARBOCEL® ZZC 500	400	gray

Blending Instructions

Short to medium-length (40 µm - 500 µm) ARBOCEL® fibers are usually easy to blend. If high-performance mixers with cutter heads (e.g. Eirich, Lödige, or m-tec blades) are available, it is to some extent possible to blend longer ARBOCEL® fibers.

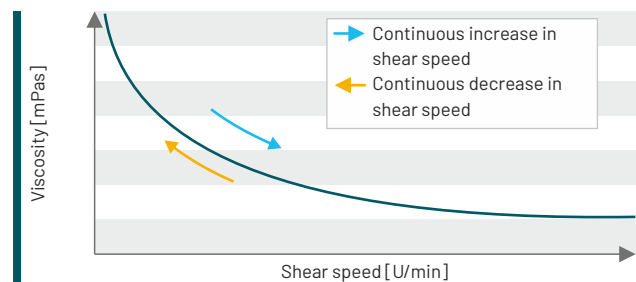


Guidance Notes

It is essential that the working consistency is adjusted, not the appearance, since ARBOCEL® fibers have structural viscous properties. This means that the viscosity appears greater at rest than when shear forces are at work (i.e. when the product is being stirred, applied by brush, etc.).

ARBOCEL® absorbs some water of the mix, so its recommended to add approx. 2 parts more water to 1 part ARBOCEL® to achieve the same working viscosity.

Rheology



Pseudoplastic or structural viscous behavior of ARBOCEL®

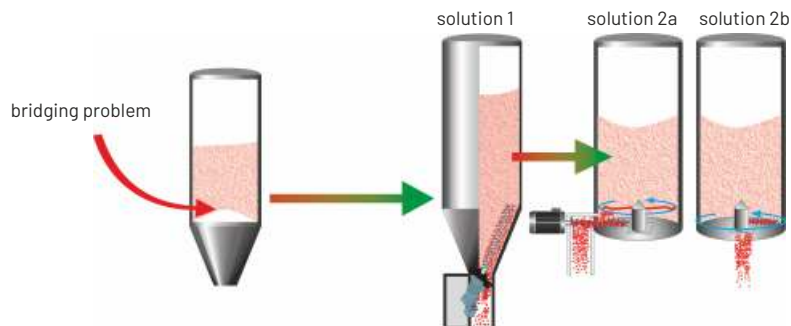
Metering and Transport Options

The material handling characteristics of ARBOCEL® fibers are typically more difficult than those of the basic products used in construction chemistry (e.g. sand, cement, etc.).

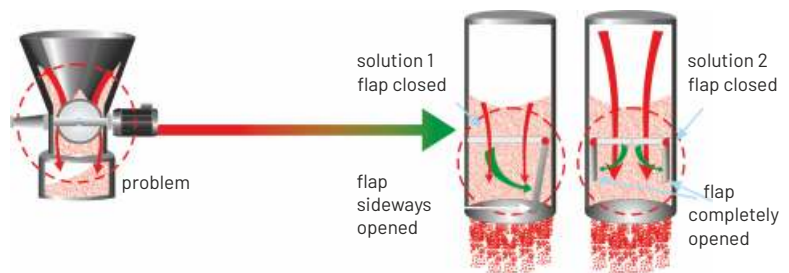
JRS will be happy to assist you in matters relating to the metering, storage and transport of ARBOCEL® products. Take advantage of our expertise in the bulk handling of our ARBOCEL® fibers.

Where can metering / transport difficulties arise?

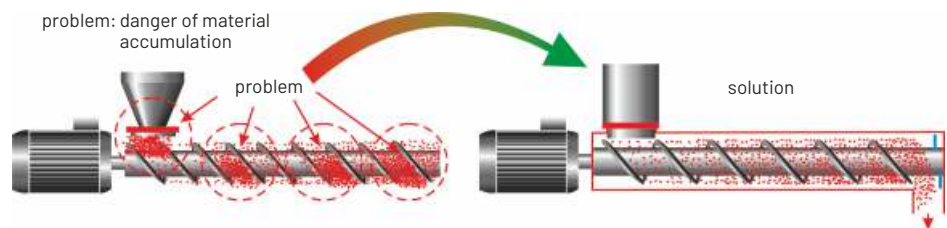
in conical silos



on weighing machines



in worm conveyors



Applications and Main Types

Cement tile adhesives

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® BWW 40	white	200 µm	0.4 - 0.5 %
ARBOCEL® FD 40	off-white	250 µm	0.3 - 0.4 %
ARBOCEL® ZZC 500	gray	400 µm	0.4 - 0.5 %

If dust is a subject, please ask for the suited ARBOCEL® LD type.

Advantages with ARBOCEL®

- > Improves slump resistance of the adhesive (reduces tile slip)
- > Improves workability
- > Reduces undesirable sticking to tools
- > In many cases longer open time and better adhesion strength



Adhesives and reinforcing compounds in exterior insulation finishing system (EIFS)

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® PWC 500	off-white	500 µm	0.3 - 0.4 %
ARBOCEL® ZZC 500	gray	400 µm	0.3 - 0.4 %

Advantages with ARBOCEL®

- > Improves slump resistance
- > Improves workability
- > Reduction of formulation costs



Joint fillers for plasterboards / filler compounds

binder: cement-lime, cement, gypsum, gypsum lime

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® FD 00	off-white	150 µm	0.5 - 1.0 %
ARBOCEL® FD 40	off-white	250 µm	0.3 - 0.8 %

Advantages with ARBOCEL®

- > Reduces cracking and shrinkage
- > Improves workability
- > Improves standability



Stuccos / plasters / 3D mortars

binder: cement-lime, cement, gypsum, gypsum lime

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® PWC 500	off-white	500 µm	0.4 - 1.0 %
ARBOCEL® ZZC 500	gray	400 µm	0.4 - 1.0 %

Advantages with ARBOCEL®

- > Improves slump resistance
- > Improves workability
- > Inhibits micro-cracking after application and during setting
- > Can reduce the separation of light weight fillers



Skim coats

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® FD 00	off-white	150 µm	0.5 - 1.0 %
ARBOCEL® FD 40	off-white	250 µm	0.3 - 0.8 %

Advantages with ARBOCEL®

- › Suppresses cracking
- › Improves workability



Range spacers for steel mats / extruded cement profiles

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® ZZ 8/1G	gray	1000 µm	0.3 - 1.0 %

Advantages with ARBOCEL®

- › Extrusion aid
- › Improves slump resistance
- › Formulation costs can be optimized



Other Applications

ARBOCEL® for concrete and screeds

- › to reduce the plastic shrinkage

ARBOCEL® for refractory products

- › to reduce the density
- › for better dewatering and to reduce demixing of the refractory compound

ARBOCEL® for soil stabilization

- › to reduce the dust development during the application

ARBOCEL® for fire-proofing plaster to protect steel

- › to improve slump resistance
- › in case of fire, ARBOCEL® creates pores

Please ask us for the recommended grades.



Emulsion-bound Systems / Paste Systems

ARBOCEL® Grades Used

We recommend to use only pure white ARBOCEL® grades like:

ARBOCEL® BE 600/30 PU

ARBOCEL® BWW 40

ARBOCEL® BC 1000

ARBOCEL® B 400

ARBOCEL® B 00

and **ARBOCEL® hydrocolloids**



Blending Instructions

Blending ARBOCEL® fibers is usually straight forward. The addition of wetting agents is normally not required. In order to reach the final viscosity more quickly, it is advisable to add ARBOCEL® in the aqueous phase.

ARBOCEL® can also be added after production of the batch for controlling viscosity.



Guidance Notes

ARBOCEL® will increase the viscosity of the emulsion system. To achieve the same working behavior we recommend to add approx. 2 parts more water to 1 part ARBOCEL®.

Keep in mind that in systems containing ARBOCEL® it is not the apparent consistency at rest that should be set but rather the working consistency.

Systems in which ARBOCEL® is completely at rest are more viscous.

Guidance notes to activate the JRS hydrocolloids see page 10.



Applications and Main Types

Synthetic resin plasters

> Exterior use

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® BC 1000	white	700 µm	0.3 - 0.5 %
ARBOCEL® B 400	white	900 µm	0.2 - 0.4 %

> Interior use

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® BC 1000	white	700 µm	0.6 - 1.0 %
ARBOCEL® B 400	white	900 µm	0.5 - 0.9 %

Joint fillers for plasterboards / filler compounds / emulsion tile adhesives

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® B 00	white	120 µm	0.5 - 1.0 %
ARBOCEL® BWW 40	white	200 µm	0.3 - 0.8 %

Acrylic roof coatings

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® BWW 40	white	200 µm	0.4 - 0.6 %
ARBOCEL® BC 1000	white	700 µm	0.2 - 0.4 %

Emulsion paints (matt or semi-gloss)

a) Paints for airless spray application

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® BE 600/30 PU	white	40 µm	0.3 - 1.0 %

b) Paints applied by roller or brush

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® B 00	white	120 µm	0.5 - 1.0 %
ARBOCEL® BWW 40	white	200 µm	0.3 - 0.8 %

c) Crack-bridging reinforcing paints

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® BC 1000	white	700 µm	0.3 - 0.8 %



General advantages with ARBOCEL® in ready-to-use systems

- › Suppresses sheen
- › Improves rheological properties
- › Reduces density
- › Reduces cracking
- › Improves scrub cycles

In addition you can use our ...

JRS hydrocolloids for ready-to-use products

The type depends on the final product. Please ask for the right type.

Advantages with ARBOCEL® gels

- › Reduces syneresis
- › Can prolong open time
- › Improves workability
- › Rheological additive
- › Partial replacement of other chemical thickeners

Where else is ARBOCEL® used in paint applications?

- › Silicate paints
- › Lime-cement paints
- › Powder paints
- › Paints with structure effects (wood fibers)
- › Road marking paints





Bituminous / Asphalt Systems

ARBOCEL® Grades Used

The grades most commonly used are ARBOCEL® ZZ 8/1 G and ZC 500.

When used as an asbestos replacement, 30 - 50 % by weight of the asbestos quantity is usually sufficient.

The resulting deficiency of volume should be compensated by the addition of a suitable filler.

If polymer reduction is a subject ARBOCEL® FBG 66 pellet is a good option. It is a special modified ARBOCEL® fiber with bitumen, which offers better handling.

ARBOCEL® cellulose fibers result in:

- › Greater thickening
- › Better heat resistance
- › Improved workability

In comparison to group 7 asbestos, ARBOCEL® ZZ 8/1 gives a rougher and less glossy surface. If a smoother surface is required, ARBOCEL® ZC 500 is recommended. Since this product is a shorter fiber, 20 - 40 % more ARBOCEL® by weight must be added in comparison to ARBOCEL® ZZ 8/1 G.

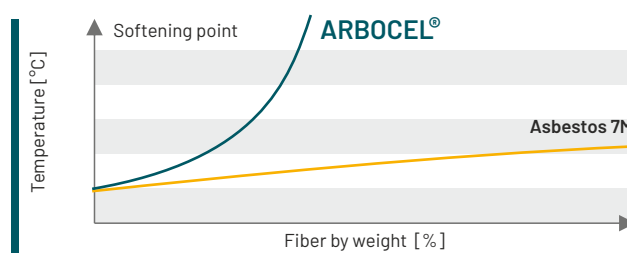
Note:

In general, when using ARBOCEL® in bitumen emulsions, make sure that ARBOCEL® is added to the bitumen emulsion in small portions while stirring (if too much ARBOCEL® is added, the bitumen emulsion may segregate and form lumps). The rest of the material can then be added and stirred.

Guidance Notes

- › The longer the average fiber length of the ARBOCEL® grade, the greater its yield and the more the viscosity is increased.
- › The shorter the average fiber length of the ARBOCEL® grade, the smoother the surface of the finished product.
- › If dissolvers are used, we recommend to add the fibers at the end of the blending process.
- › With moderate to medium-viscosity cold bitumen compounds, sedimentation may occur. This can be inhibited by stabilizers such as magnesium coated silicates or pyrogenic silicic acids.
- › In case the bitumen product is applied by airless spray, the correct ARBOCEL® grade for the nozzle size must be used to prevent clogging.
- › The use of ARBOCEL® fibers can lead to a subsequent thickening effect and thus to an increase in viscosity. This effect also occurs with solvent-based bitumen products (sol-gel changes), especially with petroleum-based cold bitumen. This effect normally takes place within a few days.

It is also interesting to note that the softening point is higher than for Asbestos 7M with the same amount added and that it also increases more steeply.



Applications and Main Types

Roof coatings (with or without aluminium)

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® ZZC 500	gray	400 µm	2.0 - 6.0 %
ARBOCEL® ZZ 8/1 G	gray	1000 µm	1.0 - 4.0 %

Advantages with ARBOCEL®

- › Replaces asbestos
- › Increases heat resistance
- › Reduces tendency of aluminum particles (in product) to settle out

Polymer modified bitumen roof membranes

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® ZZC 500	gray	400 µm	1.0 - 5.0 %
ARBOCEL® FBG 66	gray	Pellet approx. 2 - 10 mm	1.0 - 5.0 %

Advantages with ARBOCEL®

- › Increases heat resistance
- › Partial replacement of polymer
- › Easy to disperse compared to some polymers



Bitumen binding strips

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® ZZ 8/1 G	gray	1000 µm	5.0 - 8.0 %

Advantages with ARBOCEL®

- > Increases heat resistance
- > Replaces asbestos
- > Improves workability

Bitumen sealings / putties

Brand name	Color	Ø Fiber length	By weight
ARBOCEL® ZZC 500	gray	400 µm	4.0 - 7.0 %
ARBOCEL® ZZ 8/1 G	gray	1000 µm	3.0 - 6.0 %

ARBOCEL® is usually used only in medium and high-viscosity systems.

Advantages with ARBOCEL®

- > Replaces asbestos
- > Increases heat resistance
- > Inhibits cracking





LIGNOCEL®

Wood Fiber Materials

Wood Fiber Products

are used in construction only if wood constituents (lignin, resin and hemicellulose) will not adversely affect the finished product. Wood constituents can result in yellowing, bleaching, discoloration, etc.

LIGNOCEL® Properties

Size

- › Fine powder to coarse cubic particles

Color

- › Depending on the kind of wood, yellow or brown

Function

- › Lightweight filler
- › Structure provider
- › Can give better mechanical strength, e.g. in panels

Used amount

- › Depending on the application 5 - 40 %

Applications

- › Plasterboards
- › Wood putties
- › Magnesite screeds
- › Plasticine
- › Brushable wall paper paints



LIGNOCEL® C 120



LIGNOCEL® BK 40-90



LIGNOCEL® Type 9



LIGNOCEL® HB 0-3000



Fibers for Life.

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