APPLICATION INFORMATION

ADDITIVES FOR CURTAIN COATING

Contents

Introduction

Curtain coating is an increasingly common pre-metered coating technique where the liquid coating forms a curtain which falls onto the moving substrate. Curtain coating allows for:

- Fast coating speeds
- Thin coating layers
- Improved uniformity
- Contour matching
- Multi-layer coatings

There are however challenges associated with curtain coating including:

- The entrapment of foam within the coating color (resulting in pinholes/craters/fish eyes)
- Breaking of the coating upon contact with the substrate due to high shear forces
- Splitting of the curtain as a result of high surface tensions (egging)

Note

To ensure the best appearance and full functionality, please open in Adobe Acrobat.

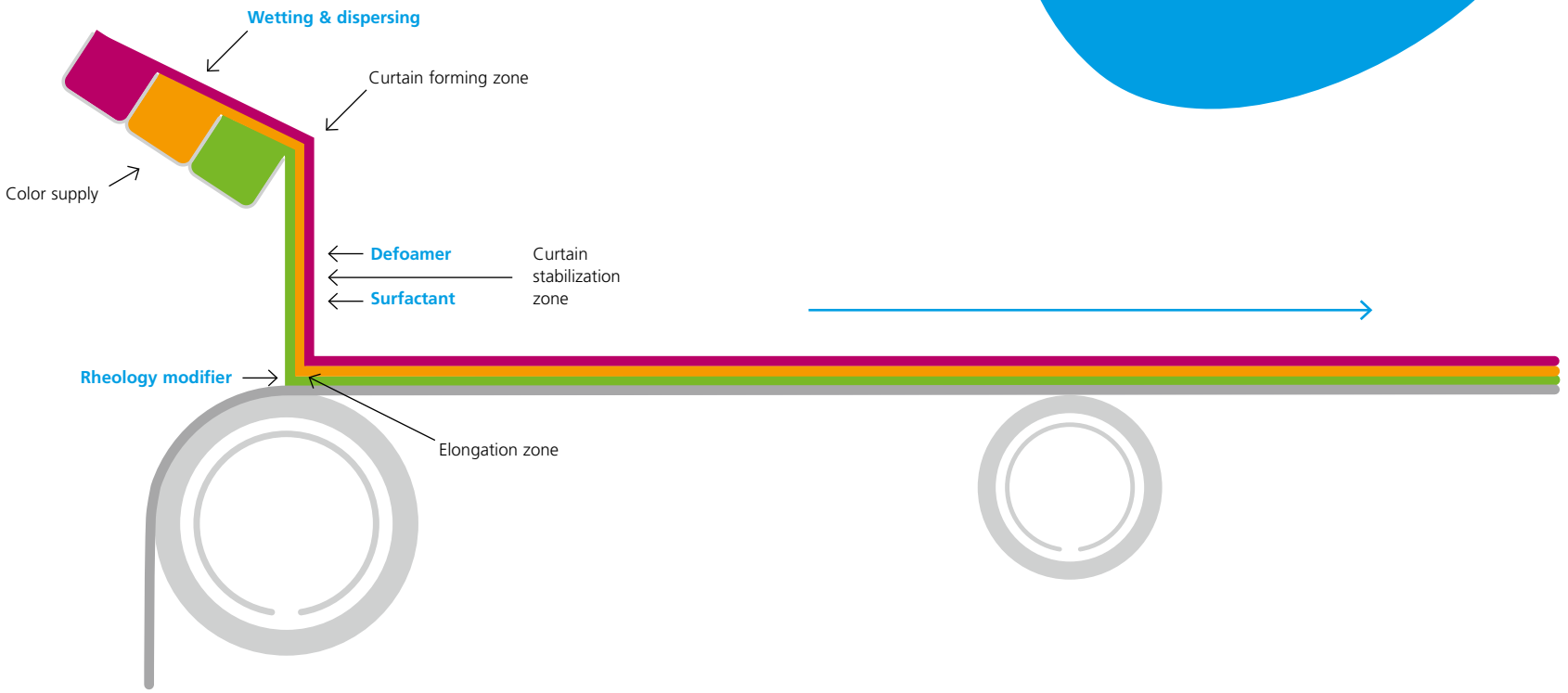
BYK additives for curtain coating

BYK offers a range of additives to improve the curtain coating process (G.01) and ensure excellent coating quality with minimal impact on final coating properties.

Key benefits of BYK additives

- High cost efficiency
- Easy to incorporate at any stage of manufacturing
- Long-lasting effects
- Compatible with a variety of formulations

Schematic of a curtain coater



Wetting and dispersing

Effective dispersion within the coating color is essential for curtain coating to provide a uniform coating throughout the production run.

The viscosity of the system can be used to evaluate the efficiency of the wetting. The lower the viscosity the better. The efficiency is system-dependent as illustrated in G. 02.

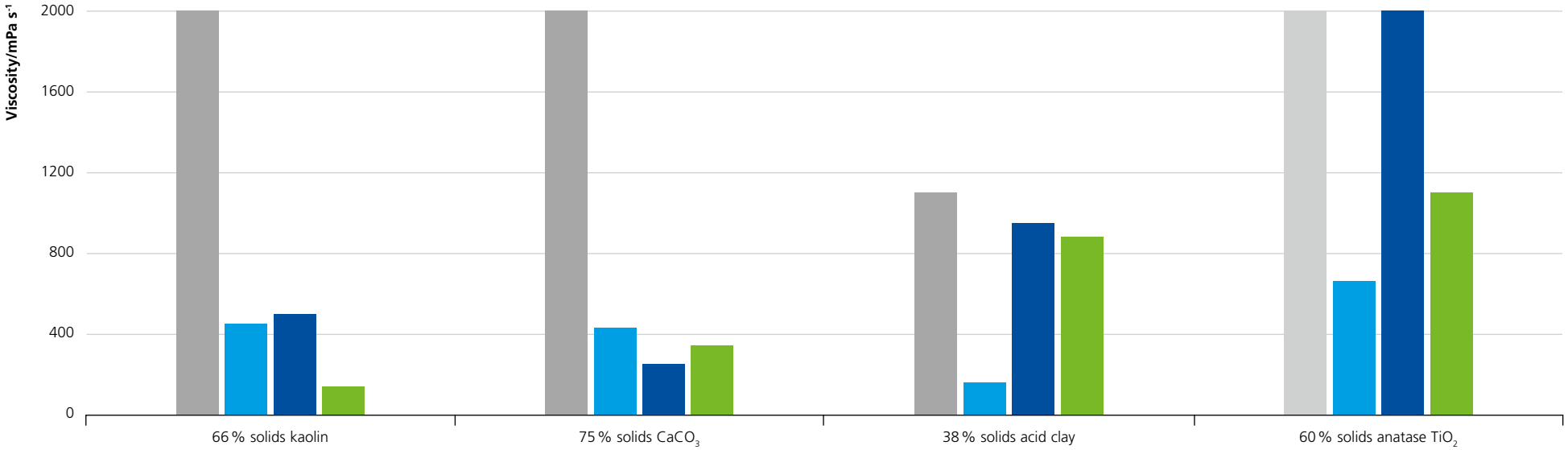
In addition to ensuring complete dispersion, anti-settling properties may also be required, particularly for heavy particles such as fluorescent pigments. For aqueous systems, **OPTIGEL-WX** is highly recommended in low levels.

Wetting and dispersing additive recommendation for coating pigments

Pigment	Recommended additive
$CaCO_3$	DISPERBYK-190*
Kaolin	DIPSERBYK-199*
TiO_2	BYK-154

* Biocide-free version available (BF) T. 01

BROOKFIELD-RV viscosity measurements for various pigment slurries used by paper coaters



G. 02

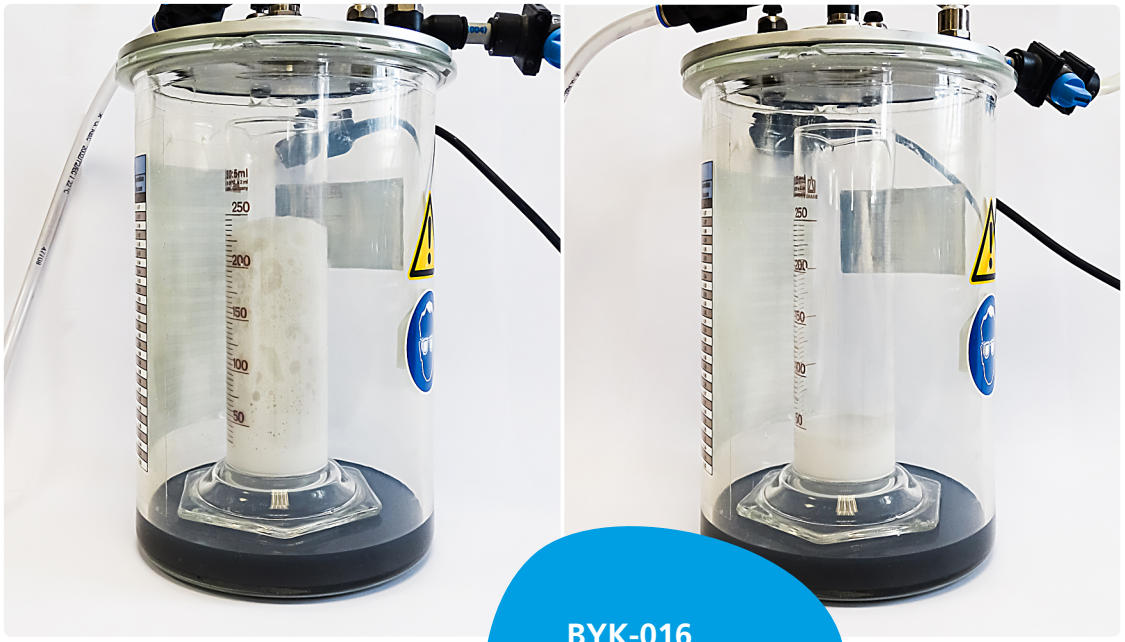
Defoamers

The presence of foam is common within the curtain coating process. This can result in surface defects upon coating such as cratering. For paper curtain coating, BYK's primary recommendations are **BYK-016** and **BYK-025**. **BYK-016** and **BYK-025** significantly reduce the amount foam in a coating color (G. 03).

The effectiveness and compatibility of defoamers are system-dependent and therefore BYK offers a wide range of defoamers to cover all eventualities and to provide optimal defoaming performance.

For microfoam (< 100 µm), a combination of **BYK-019** and **BYK-024** in a 3:2 ratio is recommended.

Coating color with no additive (left) versus coating color with 0.2 % BYK-016 (right)



G. 03

BYK-016

- VOC-free
- Approved for food contact

BYK-025

- High-performance
- Silicone-containing defoamer

Dynamic surface tension

BYK-3410 is BYK's number one recommendation for reducing the dynamic and static surface tension of the coating color and preventing curtain splitting (G. 05).

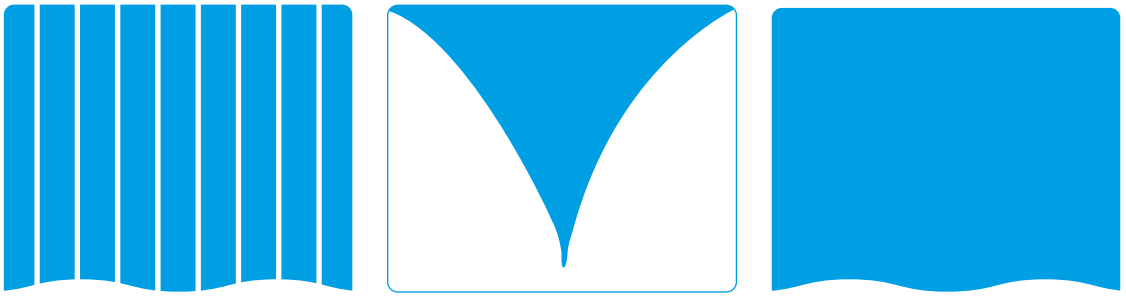
Reducing the dynamic surface tension of the coating ensures that new surfaces are rapidly stabilized (G. 04), allowing coating machines to run at faster speeds.

Possible curtain flow diagrams

No curtain = rheology and surface tension issues

"Egging" = surface tension issues

Good curtain = suitable properties



G. 04

BYK-3410

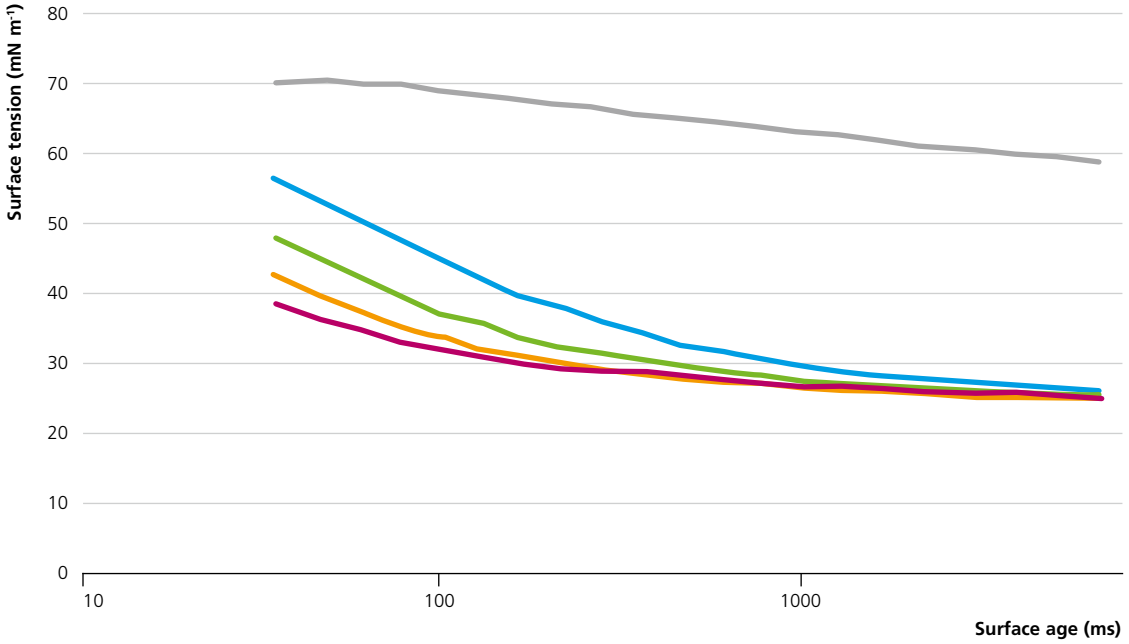
- Silicone-free
- Approved for food contact
- Reduces "egging"
- Improves substrate wetting
- Has minimal impact on final coating properties

BYK-DYNWET 800 is a high-performing alternative to **BYK-3410** which can be used when **BYK-3410** is not compatible in the system (G. 06). **BYK-DYNWET 800** has very low foam stabilization and is known to work in a range of high-speed processes.

Another alternative is the silicone-containing **BYK-3400** which produces a similar level of surface tension reduction as **BYK-3410** whilst having a low impact on the final surface slip.

Surface tension of coating color with the incorporation of BYK-3410

DST in clay slurry



Clay slurry w/o additive + 0.25 % BYK-3410 + 0.50 % BYK-3410 + 0.75 % BYK-3410 + 1.00 % BYK-3410 **G. 05**

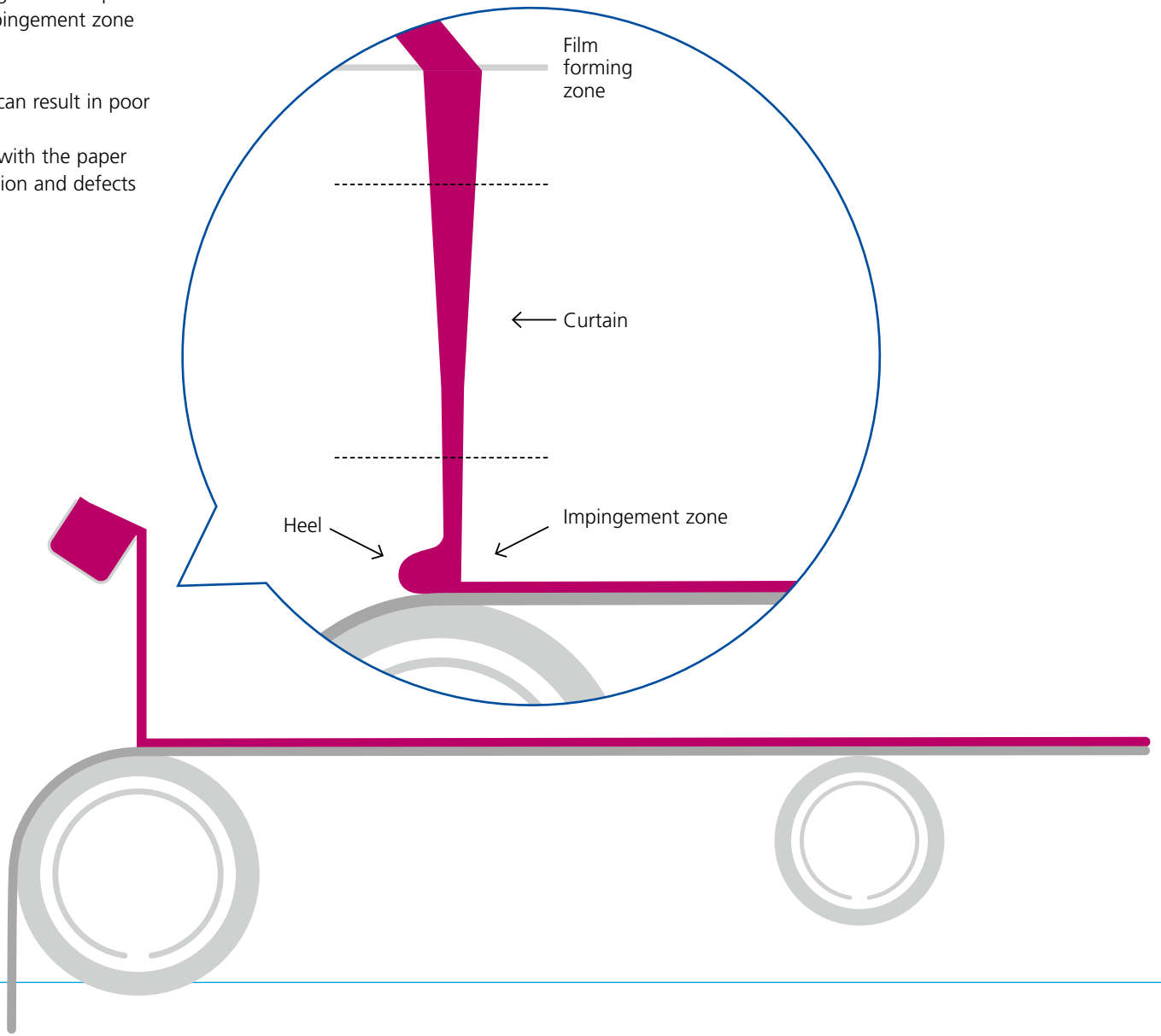
Impact of BYK-DYNWET 800 on a curtain

G. 06

Rheology modifiers

In the curtain coating process, the coating color is exposed to high shear forces, especially at the impingement zone (G. 07).

Two things can occur in this zone which can result in poor coatings:
1. Breaking of the coating upon contact with the paper
2. Turbulent flow resulting in heel formation and defects



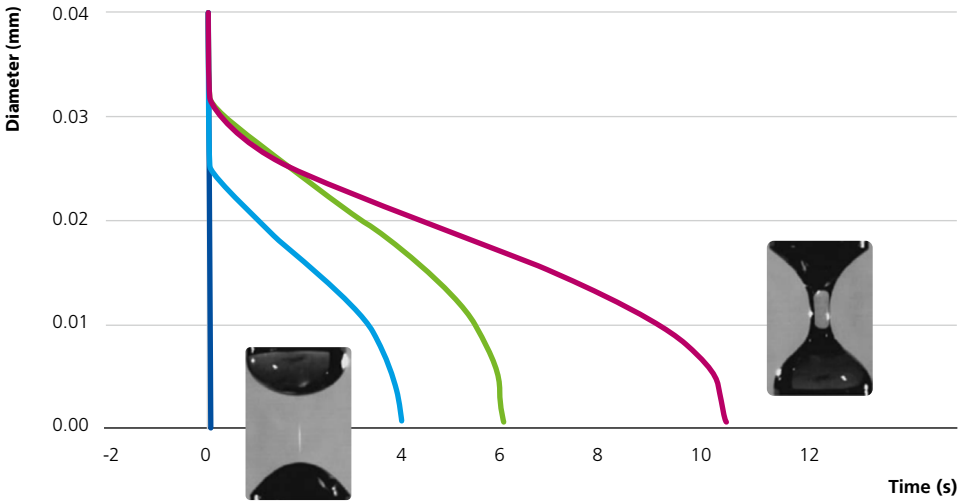
Schematic of a falling curtain

To overcome these issues, a high-shear thickener is required which provides elongational stability (G. 08).

RHEOBYK-T 1000 VF, RHEOBYK-T 1010 VF and **RHEOBYK-L 1400 VF** are VOC-free associative thickeners which provide elongational stability (increase the "stretchiness" of the fluid). They also increase viscosity at high shear, while having minimal effect on viscosity at low shear (G. 09), which is important for reducing turbulent flow.

These are ideal for curtain coating processes as they:
- Increase the viscosity in the impingement zone
- Help reduce turbulent flow
- Increase elongational stability
- Have minimal impact on pumpability and flow in the lower shear parts of the process

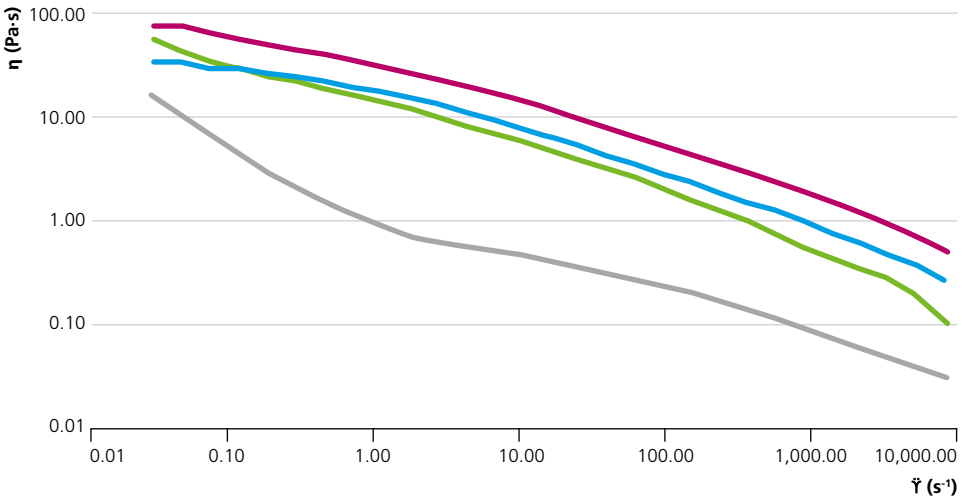
Elongation of AQUACER 1061 with 2.0 % RHEOBYK addition



AQUACER 1061 AQUACER 1061 + 2.0 % RHEOBYK-T 1000 VF
AQUACER 1061 + 2.0 % RHEOBYK-T 1010 VF AQUACER 1061 + 2.0 % RHEOBYK-L 1400 VF

G.08

Rheology profiles of 2.0 % addition of RHEOBYK to AQUACER 1061



AQUACER 1061 2.0 % RHEOBYK-T 1000 VF 2.0 % RHEOBYK-T 1010 VF
2.0 % RHEOBYK-L 1400 VF

G.09

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