



# Efka<sup>®</sup> PX 4780 / 4787

Innovative, reactive high  
performance dispersing agents  
for solvent-based systems

Ludwigshafen, 27. March 2020

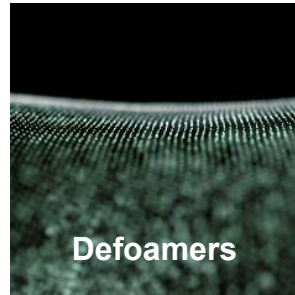
 **BASF**

We create chemistry

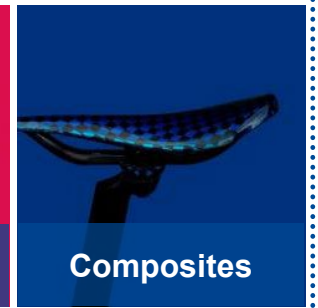
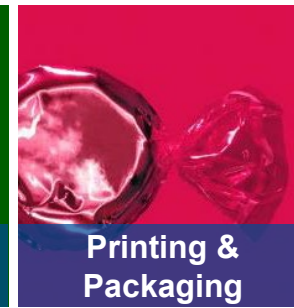
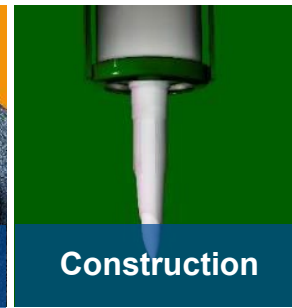
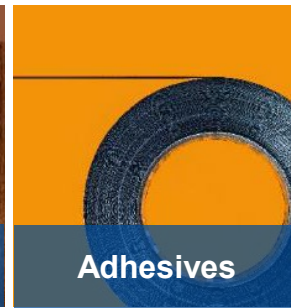
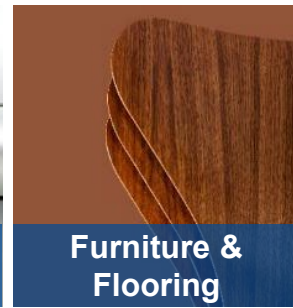
# Agenda

1. Introduction
2. Performance Highlights
3. Dual Anchoring Mechanism
4. Co-Reactive Functionalities
5. Summary

# Our comprehensive portfolio enables solutions for various industries



BASF is the premiere provider of **Performance & Formulation Additives** for the paints and coatings industry



# Strong brands to empower your business

Water-based brands	Application	Solvent-based* brands
Dispex <sup>®</sup> / Dispex <sup>®</sup> Ultra	DISPERSING AGENTS	Efka <sup>®</sup>
Foamaster <sup>®</sup> / FoamStar <sup>®</sup>	DEFOAMERS	Efka <sup>®</sup>
Rheovis <sup>®</sup> (organic) / Attagel <sup>®</sup> (clays)	RHEOLOGY MODIFIERS	Efka <sup>®</sup>
Hydropalat <sup>®</sup>	WETTING AGENTS	Efka <sup>®</sup>
Loxanol <sup>®</sup>	FILM-FORMING AGENTS	Efka <sup>®</sup>
Tinuvin <sup>®</sup> / Lignostab <sup>®</sup>	LIGHT STABILIZIERS	Tinuvin <sup>®</sup> / Chimassorb <sup>®</sup>
Irganox <sup>®</sup>	ANTIOXIDANTS	Irganox <sup>®</sup> / Irgafos <sup>®</sup> / Irgastab <sup>®</sup>

\*Efka<sup>®</sup> includes also High Solids and 100% Solid Systems

# Development targets

## Develop a dispersing agent that:

- Provides excellent dispersing properties
- Reduces negative impact on physical properties

## New pigment affinity chemistry

- Improved rheological behavior

## Equip dispersant with functional groups to become crosslinkable

- Focus on NCO- and melamine-crosslinking systems
- Investigate effects on physical properties of coating

## Target applications:

Automotive / OEM

Industrial



# Efka® PX 4780 / 4787

Innovative reactive, high performance dispersing agents for solvent-based systems

**NEW  
PRODUCT**



## Application:

Efka® PX 4780 / 4787 are high molecular weight dispersing agents designed to disperse and stabilize organic pigments and carbon-blacks. Use of Efka® PX 4780 / 4787 results in significantly lower pigment paste viscosities without having to use high level of dispersants. Efka® PX 4780 / 4787 are suitable for industrial and automotive coatings, especially where resin-matrix reactive dispersant are desired.

## Performance highlights:

- Exponentially low pigment paste viscosities at lower addition levels
- Relatively consistent and stable viscosities over wide addition range
- Cross-linkable with -NCO and melamine-based resin matrices for optimal durability
- Exceptional jetness for carbon black pigments
- Excellent gloss development
- Highest available transparency in CAB-containing systems

## Characteristic Values:


	Efka® PX 4780	Efka® PX 4787
Appearance	Brownish liquid	Brownish liquid
Solvent	Solvent-free	Butyl acetate
Active ingredients	~ 100%	~ 70%
Amine value	~ 20 mg KOH/g	~ 15 mg KOH/g


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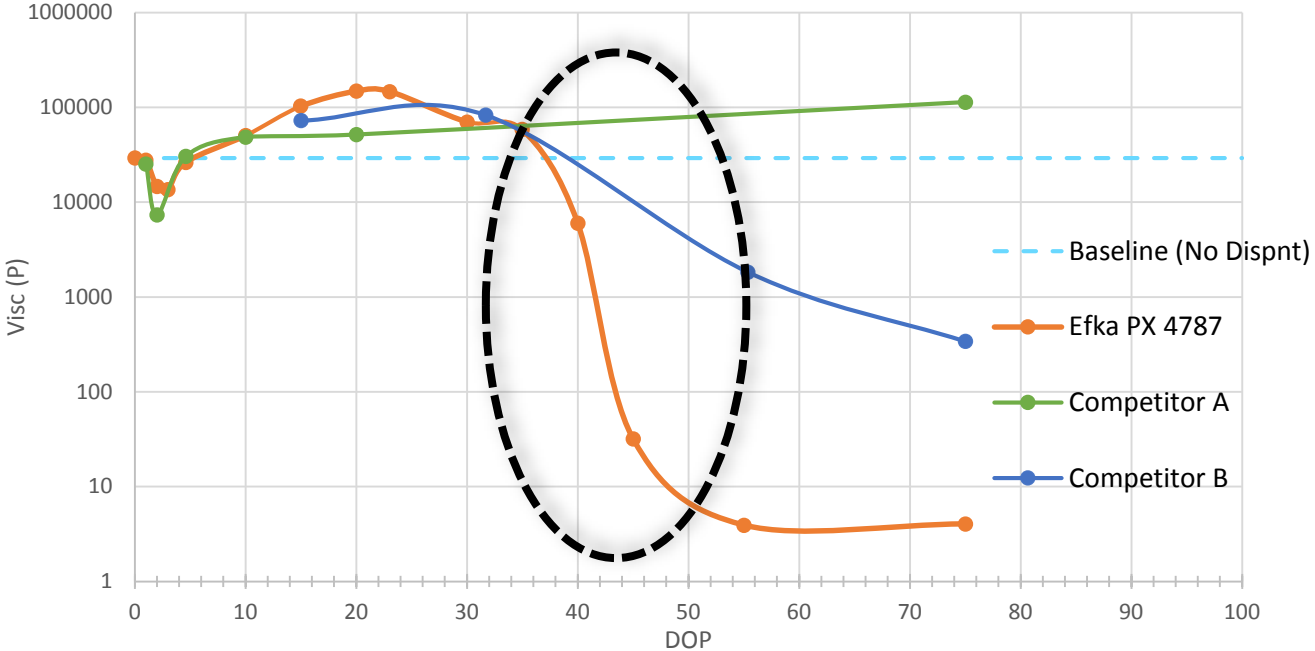
# Efka<sup>®</sup> PX 4780 / Efka<sup>®</sup> PX 4787 – Carbon Black Viscosity Curve

Very efficient dispersants vs competitive benchmarks

 Efka<sup>®</sup> PX 4787 tested in lab with Carbon black.

 Efka<sup>®</sup> PX 4787 provides efficient viscosity suppression at lower DOP than competitive products.

Monarch 1300: Comparative Visc vs DOP at 0.016 sec-1 (Low Shear); 16% PP; 12 Hr Scandex





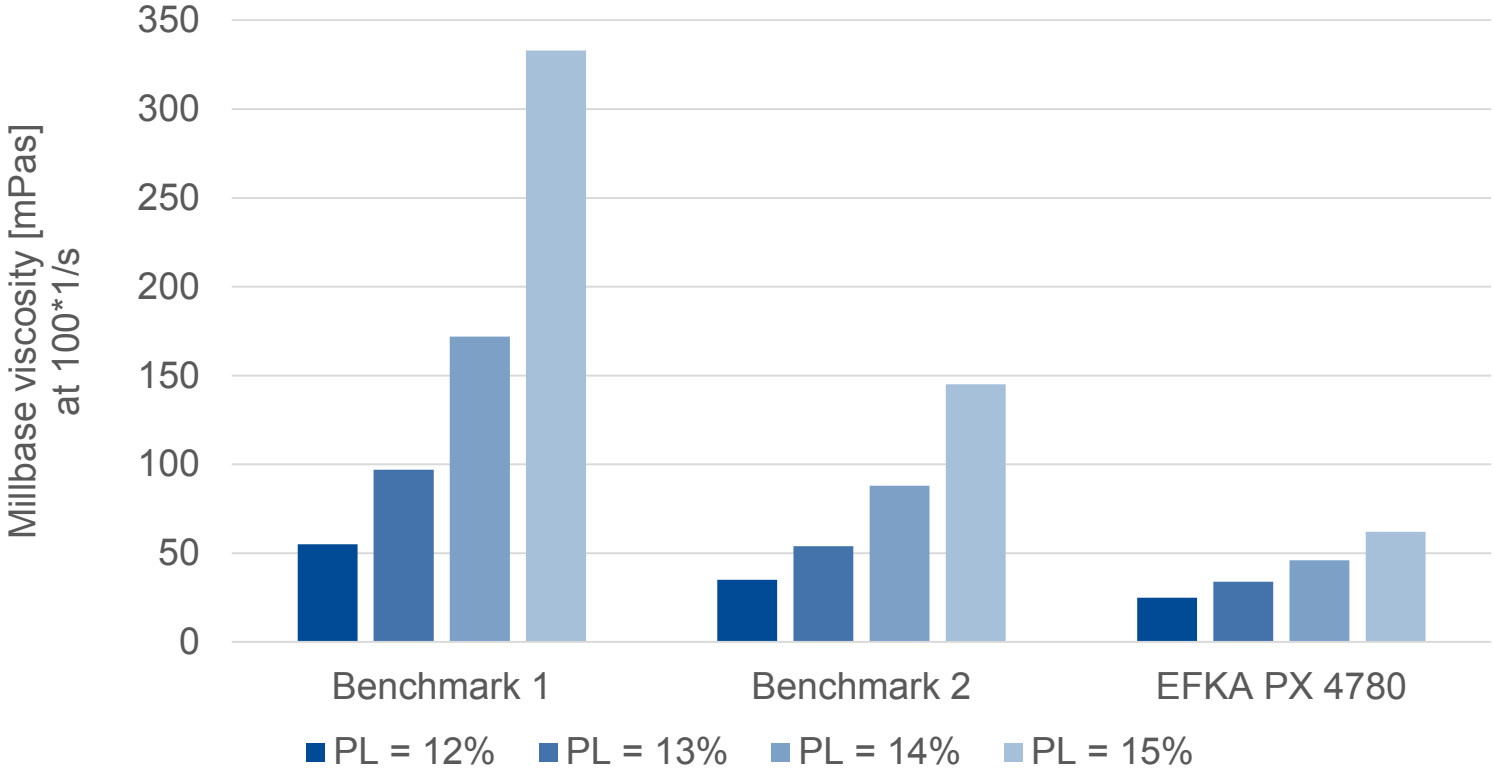
# Jetness development of different carbon black in sb 2pack PUR

## Determining factors

- **SB resin free pigment concentrates (RFPC)**
- Carbon black: Emperor 1600
- Solvent: methoxy propyl acetate
- DoP: 90%
- Pigment load: 12-15%
- 5h Skandex, 2mm glass beads,
- SB 2pack PUR: Joncryl 507 + Basonat HI 2000 NG

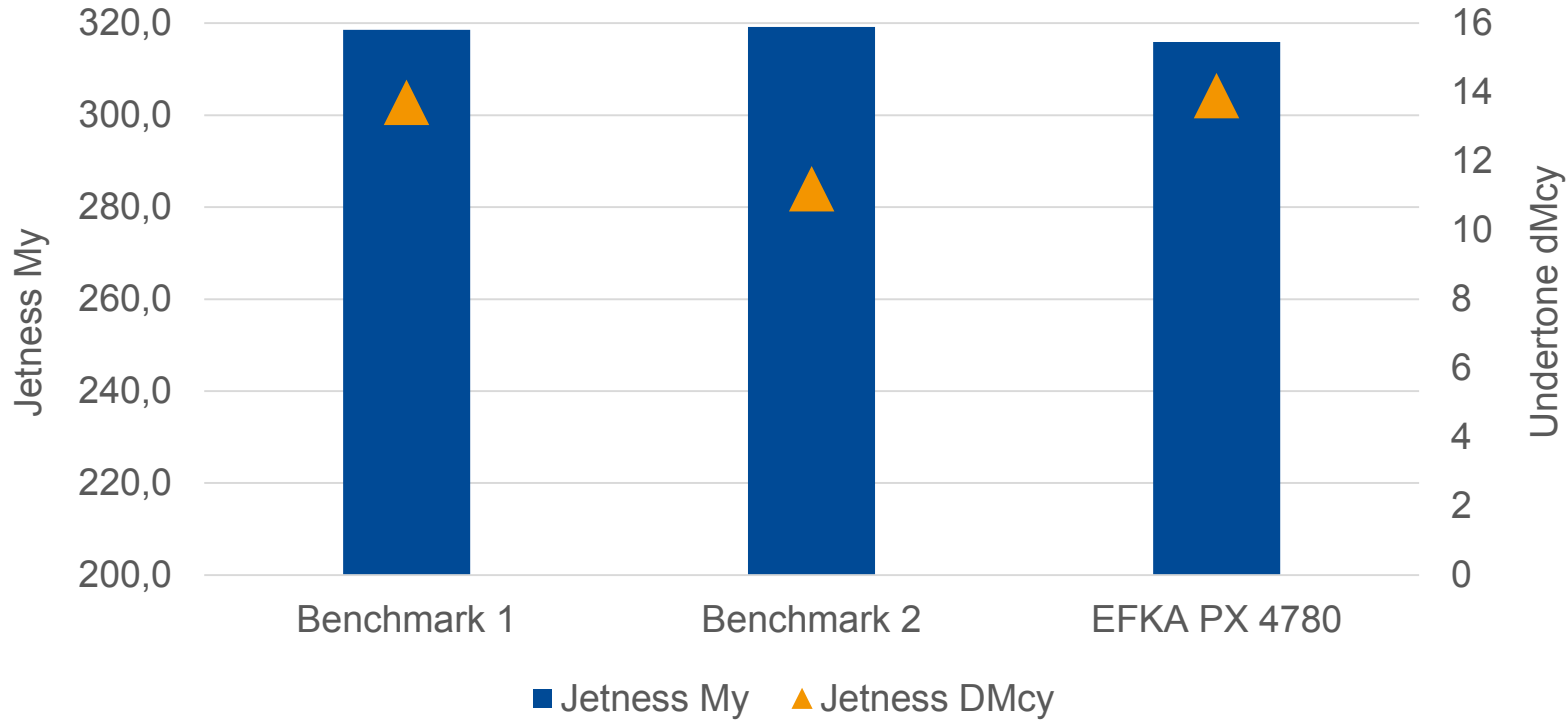


# RFPC millbase viscosity based on Emperor<sup>®</sup> 1600



Efka<sup>®</sup> PX 4780 shows the lowest mill-base viscosity and allows higher pigment loads.

# Jetness development of PC in SB 2 pack PUR with Emperor<sup>®</sup> 1600



Efka<sup>®</sup> PX 4780 shows high jetness and blueish undertone.

# Efka® PX 4780 / 4787

Significant improvement of flow and excellent viscosity reduction

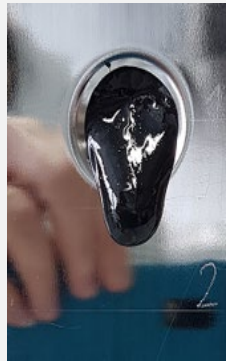
UV black-1  
blank



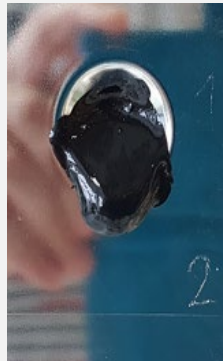
UV black-5  
Efka® PX 4780



UV black-9  
Efka® PX 4700



UV black-2  
Efka® PX 4701



## High viscosity black UV-system

Blank (w.o. additive)

Efka® PX 4780 (100% active)

Efka® PX 4700 (70% active in solvent)

Efka® PX 4701 (100% active)

## Flow of UV-system

No flow

5.25 cm  
after 10 min

1.75 cm  
after 10 min

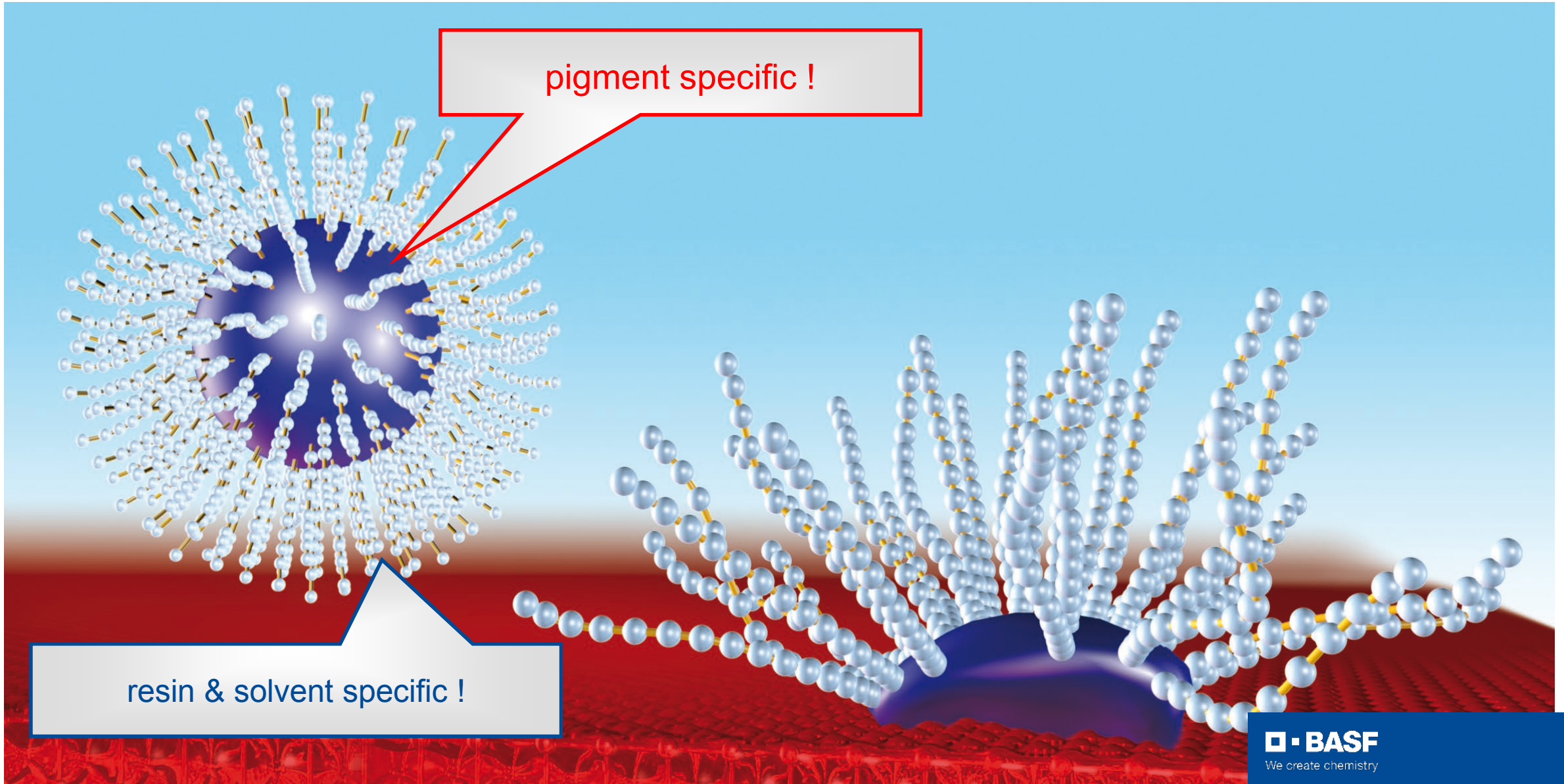
1.75 cm  
after 10 min

**flow blade:** put 3 g into cavity and place metal blade vertical and measure the flow after a certain period of time.

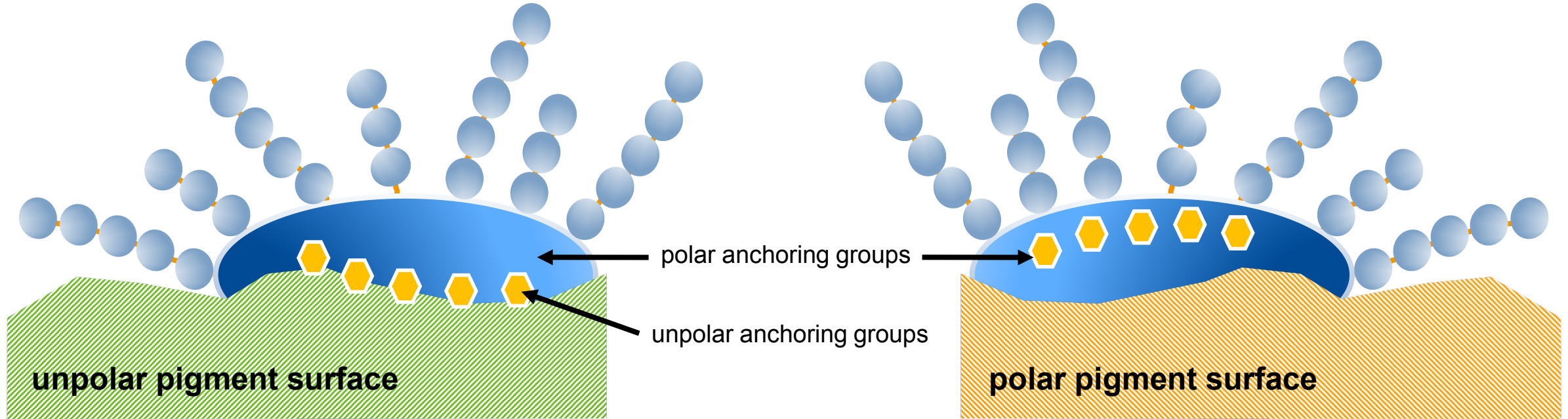
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# Advanced polymeric dispersing agents with core-shell structure



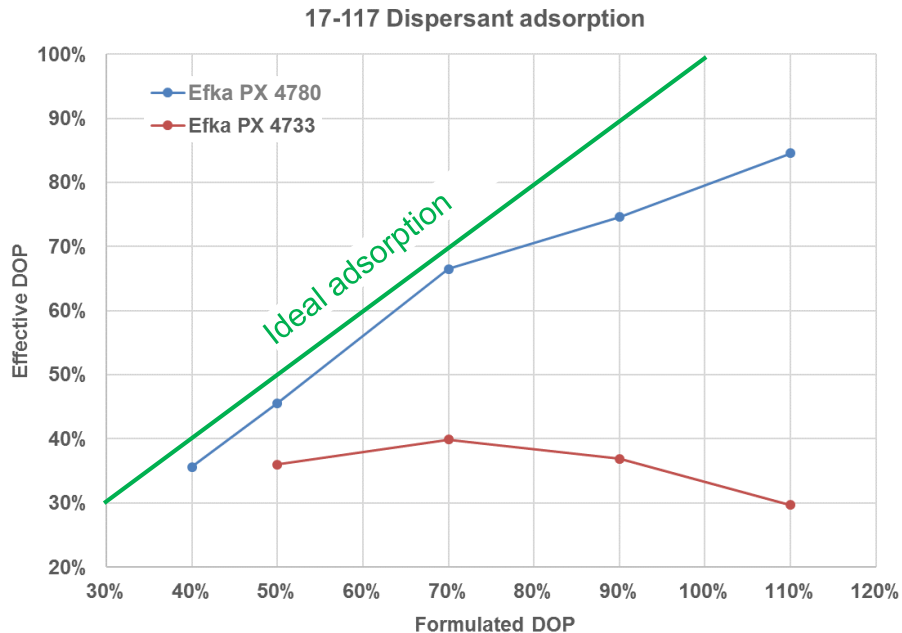
# BASF has developed novel pigment dispersants with a Dual Anchoring Mechanism



▶ Dual Anchoring Mechanism is able to adapt to **different types of pigment surfaces**, leading **overall to stronger anchoring of the dispersant**.

# Efka® PX 4780 / 4787 –

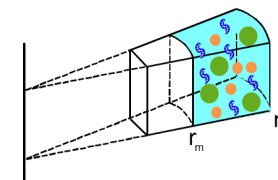
Dual Anchoring Mechanism achieves best pigment adsorption



## Efka® PX 4787 shows close to ideal adsorption behavior

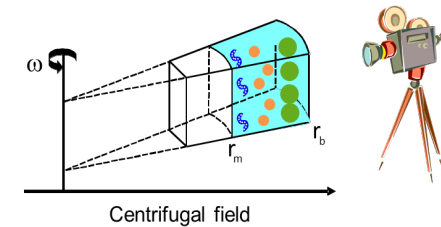
Analytical ultra-centrifuge: gives direct information of dispersant adsorption on pigment

1. Homogeneous distribution without centrifugal field



- Agglomerated pigment
- Dispersed pigment
- ⚡ Non-adsorbed dispersant

2. High-resolution separation and in-situ detection with centrifugal field



**Dual Anchoring Mechanism** improves adsorption of dispersants on pigments significantly, resulting in improved stability and low pigment dispersion viscosities.

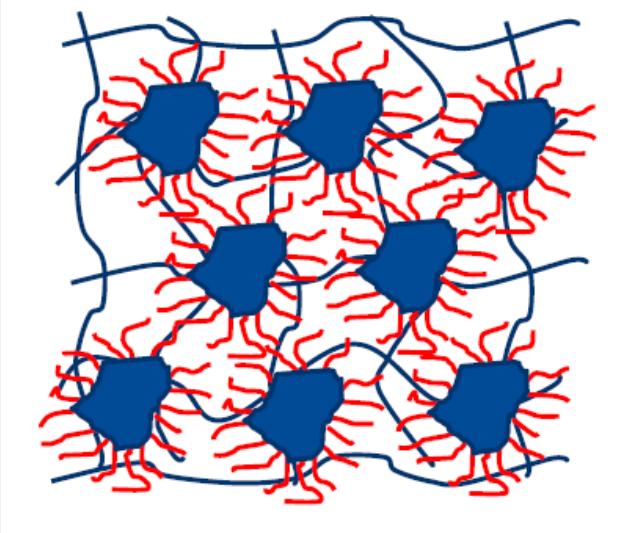


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# Efka® PX 4780 / 4787 – Cross-linkable dispersants lead to improved coating properties

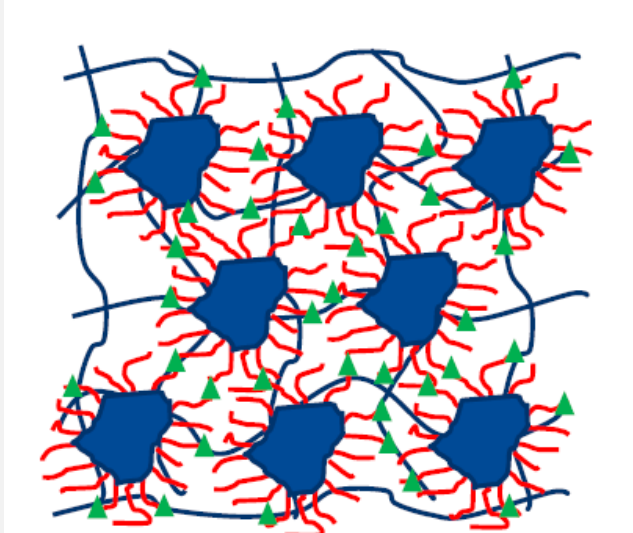
Conventional dispersing agent  
with **NO** crosslink function  
> **Weaken network**



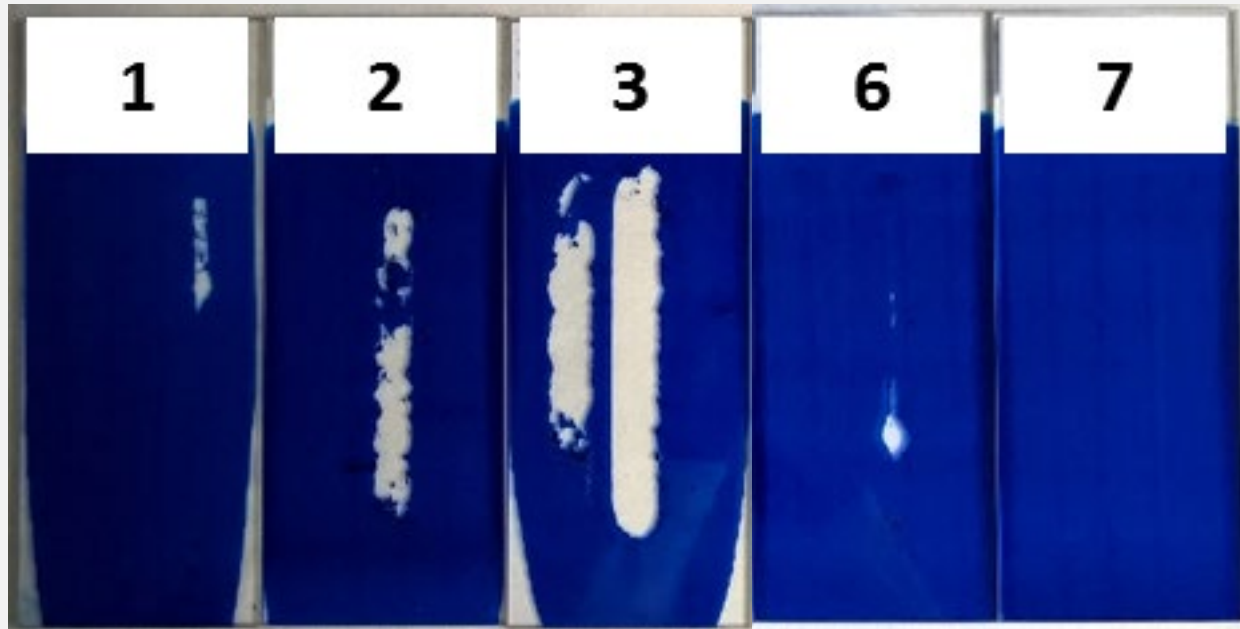
Pigment particle  
covered by  
dispersant



Advanced co-reactive dispersing agent  
with certain **crosslink ability**  
> **Enhanced network density**



# Improved MEK rub resistance with Efka® PX 4780 in a SB MF/PES system



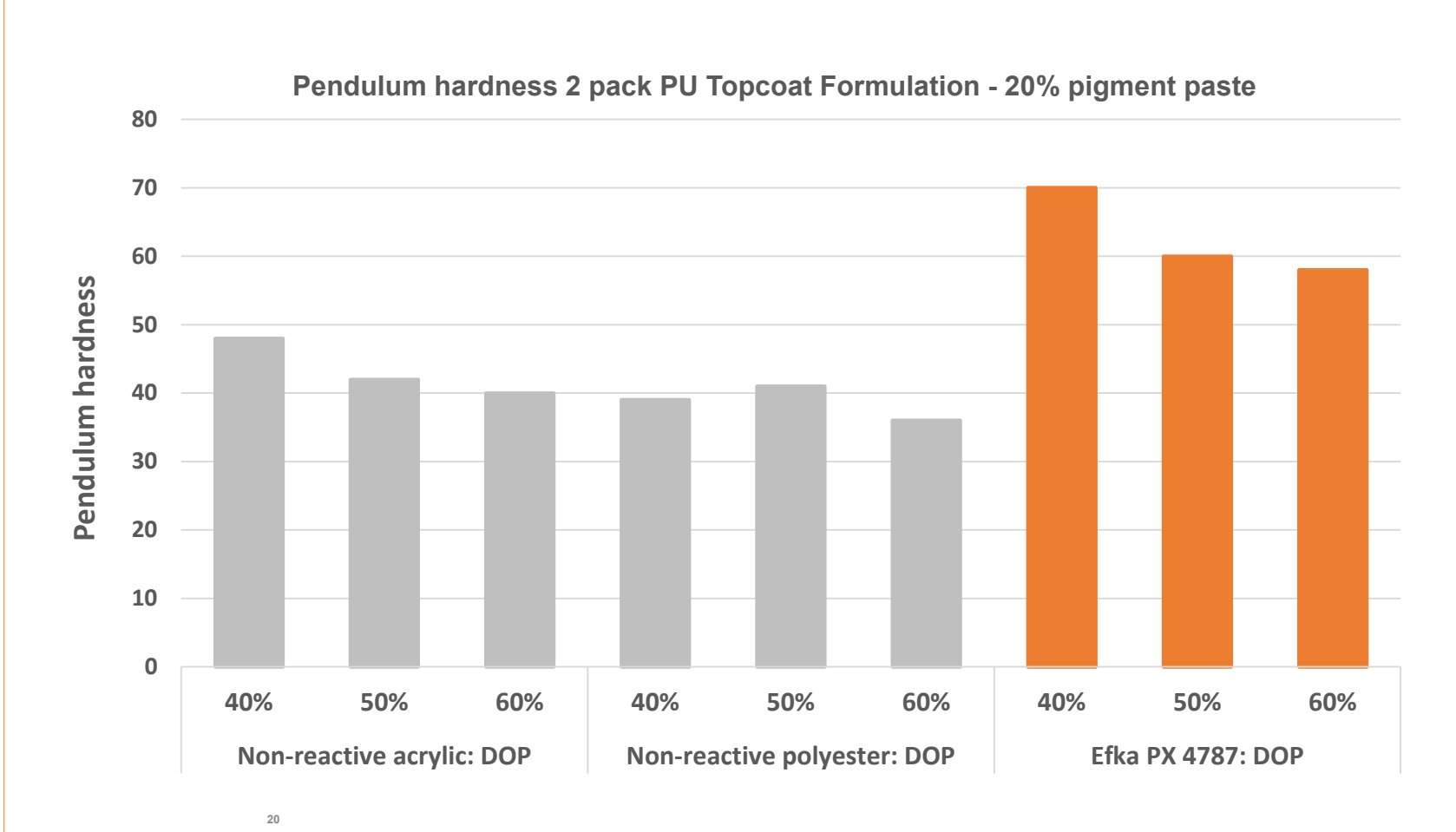
**1** blank (w/o additive)   
 **2** Benchmark 2 (25% DOP)   
 **3** Benchmark 2 (50% DOP)   
 **6** Efka PX 4780 (25% DOP)   
 **7** Efka PX 4780 (50% DOP)

Dispersant	DoP [%]	MEK rubs	Comment
w/o additive		>200	Slight abrasion
Benchmark 2 (non reactive)	25	66	Coating swells
	50	27	Coating swells
Efka PX 4780 (crosslinkable)	25	>200	Slight abrasion
	50	>200	Slight abrasion

**Pigment:** Heliogen blue L6600

# Efka® PX 4780 / Efka® PX 4787

Provides best pendulum hardness



The co-reactive nature of Efka® PX 4787 positively impacts hardness and chemical resistance.

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# Summary

## **Efka<sup>®</sup> PX 4780 (100%) and Efka<sup>®</sup> PX 4787 (70% in BuAc)**

- New dispersant technology for solvent borne industrial and automotive applications
- Dual-anchoring mechanism for optimized pigment affinity
- Provide unprecedented viscosity reduction (rheology control)
- Excellent dispersing properties with carbon-blacks and organic pigments
- Co-reacts with NCO- and melamine-crosslinking formulations
- Enhanced formulation flexibility

## **Outlook**

- Concept transfer to other application areas and waterborne applications

# Contacts



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We create chemistry



# Disclaimer

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## ■ Note

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