

We will start soon...

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Your **hosts** for this call

Loxanol® MI
Adhesion Promoter

Formulation additives
for improved adhesion



Bernd Hoewel
Presenter



**Andrea Schamp/
Kerstin Schurig**
Chat



Dr. Bernd Hoevel

**Technical Sales
Performance Additives
EMEA region**



We create chemistry

Loxanol[®] MI Adhesion Promoters

Looking for formulation additives to improve adhesion

Ludwigshafen, June 2020

Agenda

1. Introduction

2. Loxanol[®] MI Adhesion Promoter – Product Portfolio

3. Loxanol[®] MI Adhesion Promoter – Application Examples

4. Summary

Our comprehensive portfolio enables solutions for various technologies

Dispersing Agents

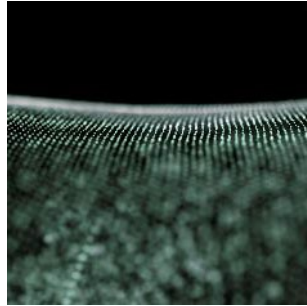


Dispex®

Dispex® Ultra

Efka® 4XXX

Defoamers

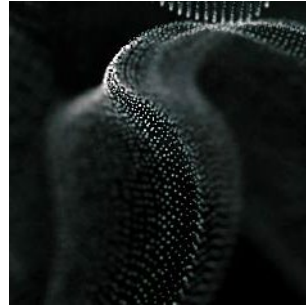


Foamaster®

FoamStar®

Efka® 2XXX

Rheology Modifiers



Rheovis®

Efka® RM 1XXX

Wetting Agents & Surface Modifiers



Hydropalat®

Efka® 3XXX

Film-forming Agents / Misc.



Loxanol®

Light Stabilizers & Anti-oxidants



Irganox®

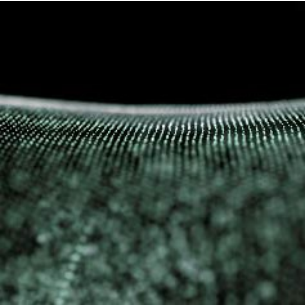
Tinuvin®

Our comprehensive portfolio enables solutions for various industries

Dispersing Agents



Defoamers



Rheology Modifiers



Wetting Agents & Surface Modifiers



Film-forming Agents / Misc.



Light Stabilizers & Anti-oxidants



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



Architectural Coatings



Industrial Coatings



Automotive Coatings



Furniture & Flooring



Adhesives



Construction



Printing & Packaging



Composites

Agenda

1. Introduction

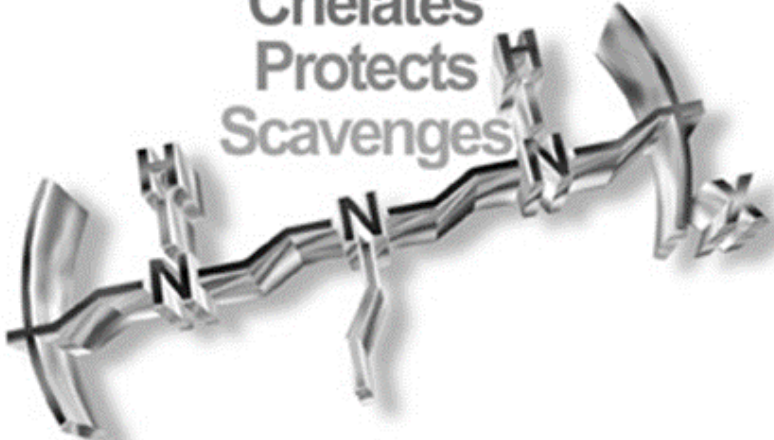
2. Loxanol[®] MI Adhesion Promoter – Product Portfolio

3. Loxanol[®] MI Adhesion Promoter – Application Examples

4. Summary

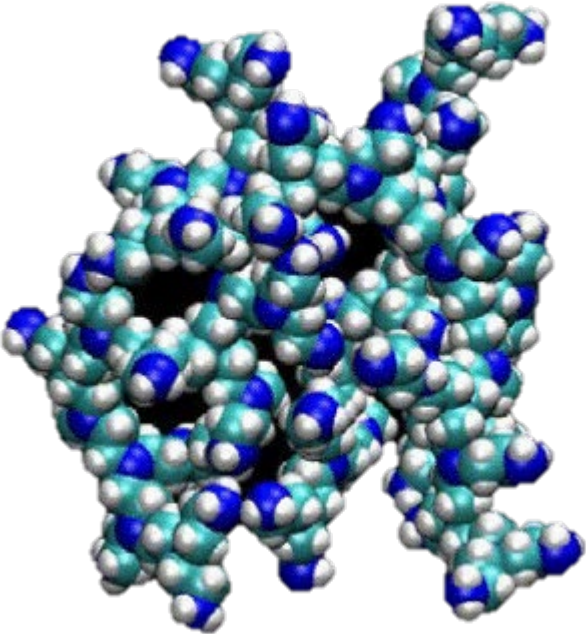
Loxanol[®] MI Adhesion Promoter are based on Polyethylenimine

Sticks
Anchors
Floculates
Modifies
Chelates
Protects
Scavenges



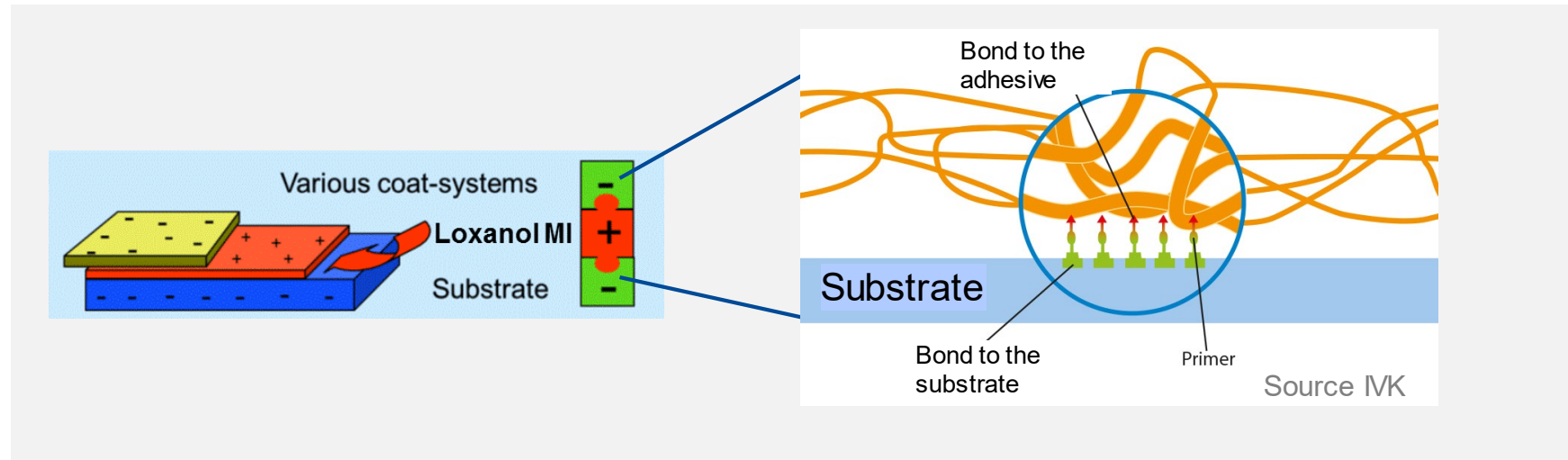
NCCNCCNCCNCCNCCN

The diagram illustrates the functional properties of polyethylenimine (PEI) and its chemical structure. A list of functions is shown in a red-bordered box: Sticks, Anchors, Floculates, Modifies, Chelates, Protects, and Scavenges. Below the list is a 3D ball-and-stick model of a PEI chain interacting with a metallic surface. At the bottom is the chemical structure of a linear PEI chain, showing a sequence of nitrogen atoms connected by ethylene groups, with terminal primary amine groups.



What makes Loxanol[®] MI types good Adhesion Promoter?

- Highly branched polymer structure for ultimate surface
- Cationic polymer (high charge density) with high affinity for surfaces and anionic substrates



- Mediates efficient adhesion (charge attraction)
- Suitable for all sorts of surfaces

Loxanol[®] MI Adhesion Promoter Types

Product Loxanol[®] MI	content (%)	Viscosity 20°C (mPa·s)	MW (g/mol)
6721	99	~ 8.000	1.300
6723	55	~ 11.000	25.000
6735*	99	~ 15.500	25.000
6730*	50	~ 25.000	750.000
6732+	24	~ 550	2.000.000
6835	50	600	2.000

← New

← New

*FCS is available
+ Non Hazardous.

Loxanol® MI Adhesion Promoter Solubilities

Loxanol MI	D.I. Water	Alcohols MeOH / EtOH / n-PA/ i-PA	N-Hexane	Ethyl Acetate	Toluol Xylol
6721	+	+	-	O	O
6735	+	+	-	O	O
6835	+	+	-	O	-
6723	+	+	-	-	-
6730	+	+	-	-	-
6732	+	+	-	-	-

+ = Soluble
- = insoluble
O = partially soluble

Loxanol® MI-Surface Treatment

Application as Primer

Substrates

- Cellulosic material (paper, viscose)
- Polyolefines (PP, PE, LDPE, HDPE)
- Polyesters (PET)
- Nylons
- Halogenated Polymers (PVC, PVDC)
- Metals (Aluminum)

Coatings

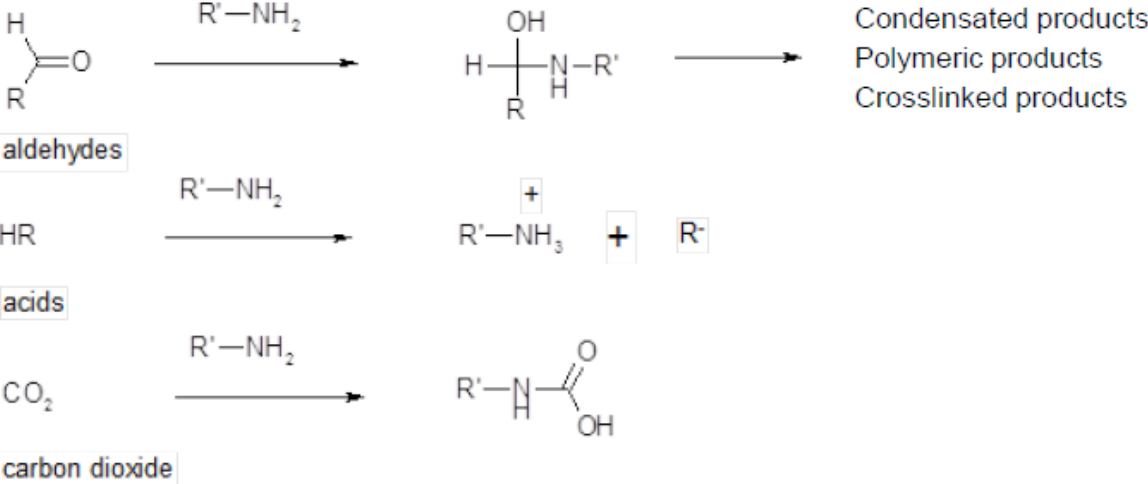
- Polyolefine resins (PE, LDPE, HDPE)
- PVAC
- Acrylics
- Halogenated Polymers (PVDC)

Loxanol® MI Types Example Applications

Application	Mol. weight	Loxanol® MI types
Primer for coatings	high	6730, 6735
Coatings	medium-high	6723, 6730, 6735
Paints	all	6730, 6835
Adhesives (PU, Epoxy, Disp.)	all	6721, 6723, 6730, 6735; 6835
Printing inks for laminate	high	6730, 6735
Printing inks	medium	6723, 6735
Dye fixative in textile	medium-high	6730
Water treatment	high	6730, 6732
Fabric conditioning (softener)	medium	6723, 6735
Aldehyde/gas scavenging	all	6721, 6723, 6730, 6735, 6835
Adhesion prom. (Composite)	medium-high	6723, 6730, 6732, 6735
Corrosion inhib. for acid media (acid cleaning ChlorMSA)	medium	6721, 6723, 6835

Loxanol® MI for Odor Control

- Loxanol® MI reacts with aldehydes (formaldehyde) and ketones which are often the source of malodour



- Loxanol® MI inhibits many enzymes as ureases (reduced biodegradation and evolution of ammonia and amines)

Agenda

1. Introduction

2. Loxanol[®] MI Adhesion Promoter – Product Portfolio

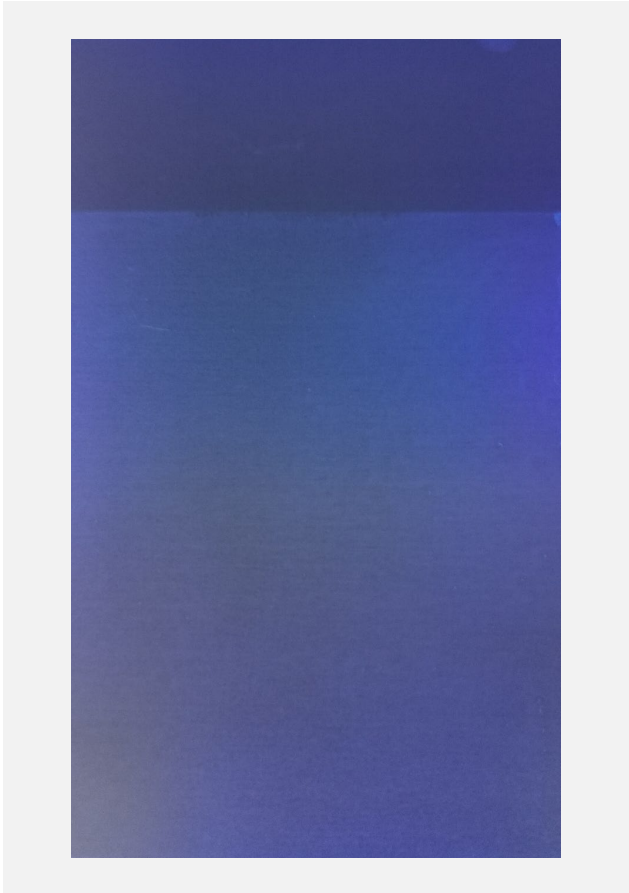
3. Loxanol[®] MI Adhesion Promoter – Application Examples

4. Summary

Example: Primer Solution for Pressure Sensitive Adhesives

<u>Material</u>	<u>Concentration</u>	<u>Effect</u>
D.I. Water	98%	Dilution
Loxanol MI 6735	1%	Adhesion
Hydropalat WE 3120	0,5%	Wetting
Tinopal NFW Liq	0,5%	Optical tracing

The primer solution should be applied at a coat weight of 1-5 g (of a 1% solution) per square meter.

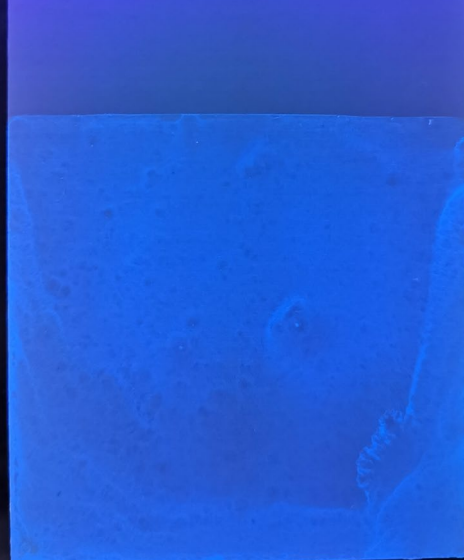


Application Examples

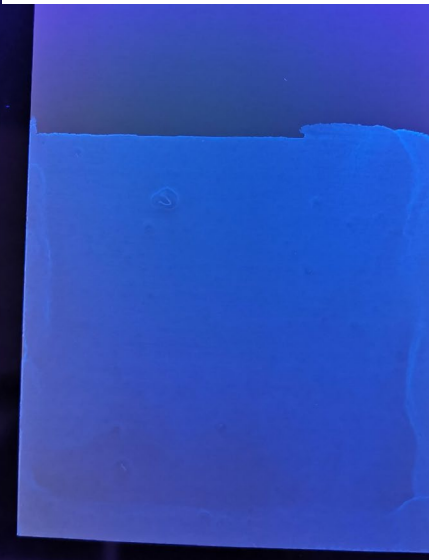
Primer b.o.
Loxanol MI 6735
(dipped)



Primer b.o.
Loxanol MI 6735 +
Hydropalat WE 3120
(dipped)



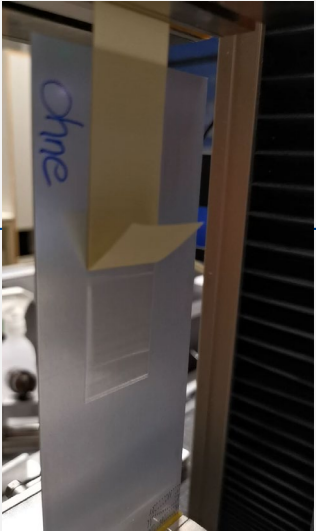
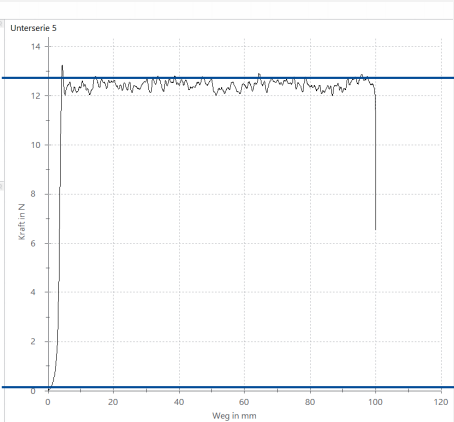
Primer b.o.
Loxanol MI 6735 +
Hydropalat WE 3120
5 microns coated



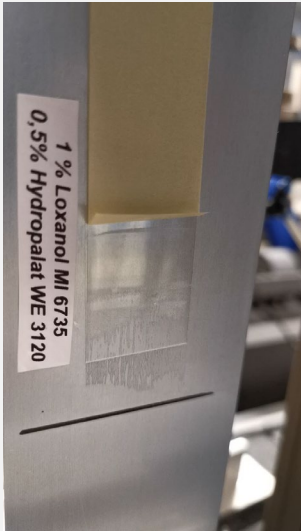
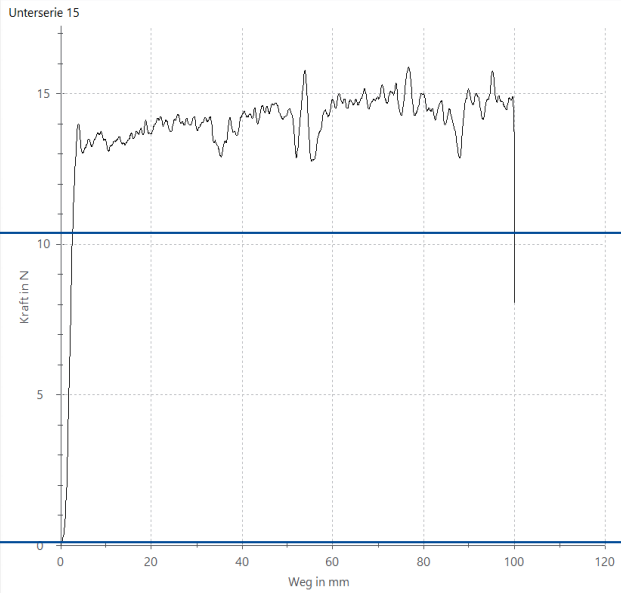
For best effect it's important to achieve a homogeneous thin coating.

180° Peel Test

ohne



Loxanol MI 6735 + Hydropalat WE 3120



	Material	F _{mit} N	F _{max} N	X-Fmittel N	X-Fmax N	Bruchbild
ohne	24h Blech	11,9	14,8	11,9	14,8	A
ohne	24h Blech	11,5	14,5	11,5	14,5	A
ohne	24h Blech	12,2	13,2	12,2	13,2	A

	Material	F _{mit} N	F _{max} N	X-Fmittel N	X-Fmax N	Bruchbild
Loxanol MI 6735 + Hydropalat WE 3120	24h Blech	17,8	23,4	17,8	23,4	K
Loxanol MI 6735 + Hydropalat WE 3120	24h Blech	16,5	20,7	16,5	20,7	K
Loxanol MI 6735 + Hydropalat WE 3120	24h Blech	13,5	26,7	13,5	26,7	K

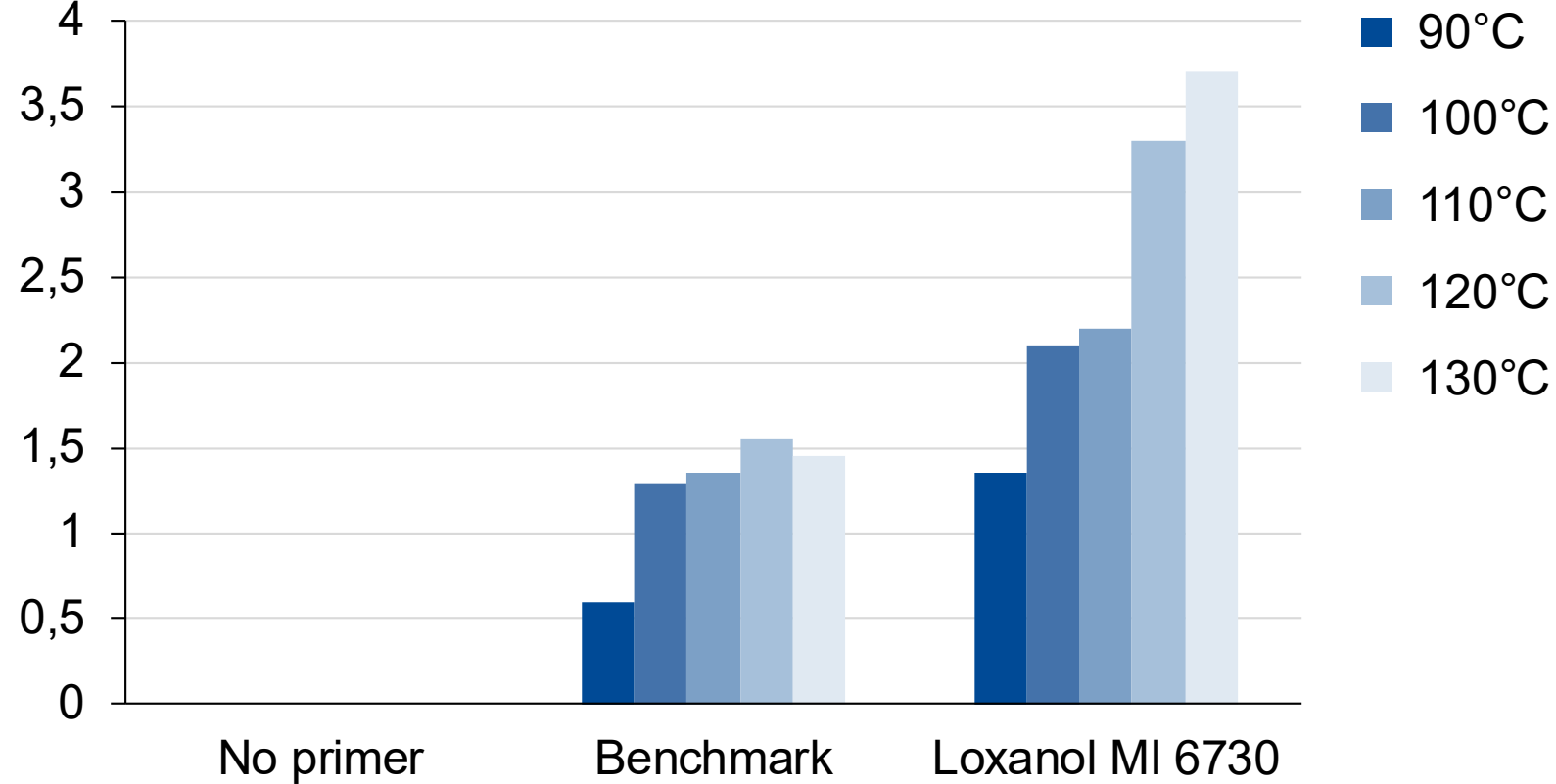
30% increase in peel values with change in failure mode.

Bond Strength of an WB Acrylic Heat Seal Lacquer (e.g. Joncryl HSL 700)

Effect on bond strength of acrylic coated

Bond strength (N/15mm)

OPP



Improvement of bond strength at different sealing temperature.

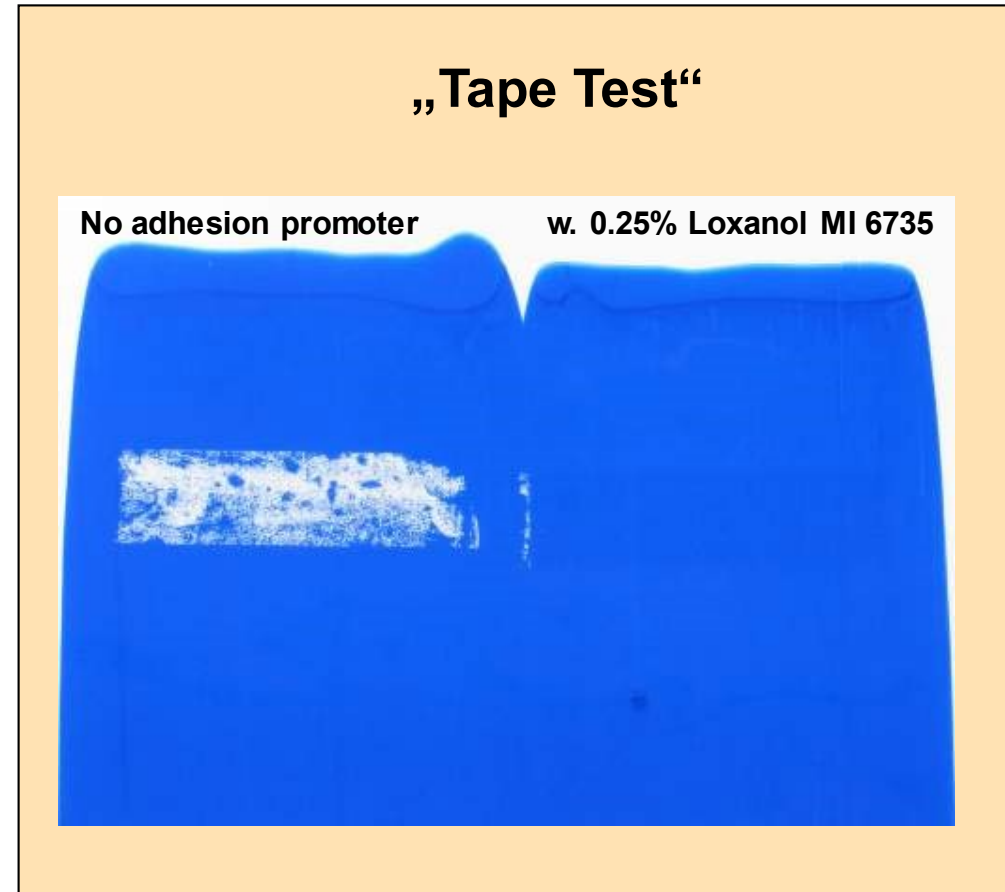
Loxanol® MI 67XX range Adhesion Promotion Effect

- For **solvent based** coatings & inks

Loxanol® MI 6735

- For **water based** coatings & inks

Loxanol® MI 6730



**printing ink on polyolefin film
based on Polyvinylbutyral**

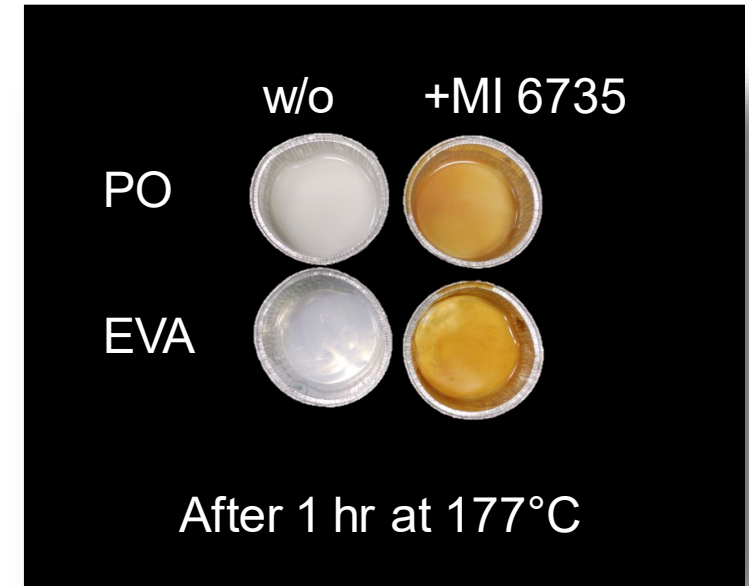
Testing of Loxanol[®] MI 6735 in Hot Melt Adhesive

- Addition of 0,5% Loxanol to hot melt adhesive was tested

	Loxanol	SAFT* [C]	PAFT** [°C]
PO		70	44
PO	+ MI 6735	70	50
EVA		75	40
EVA	+ MI 6735	75	41

Loxanol MI will only increase peel values not shear values.

- SAFT = Shear Adhesion Failure Temperature
- ** PAFT = Peel Adhesion Failure Temperature



Effect of Loxanol[®] MI 6721 on Silane Modified Polymers

Sealant w/o Adhesion Promoter



Sealant w. 0,5% Loxanol MI 6721 Adhesion Promoter

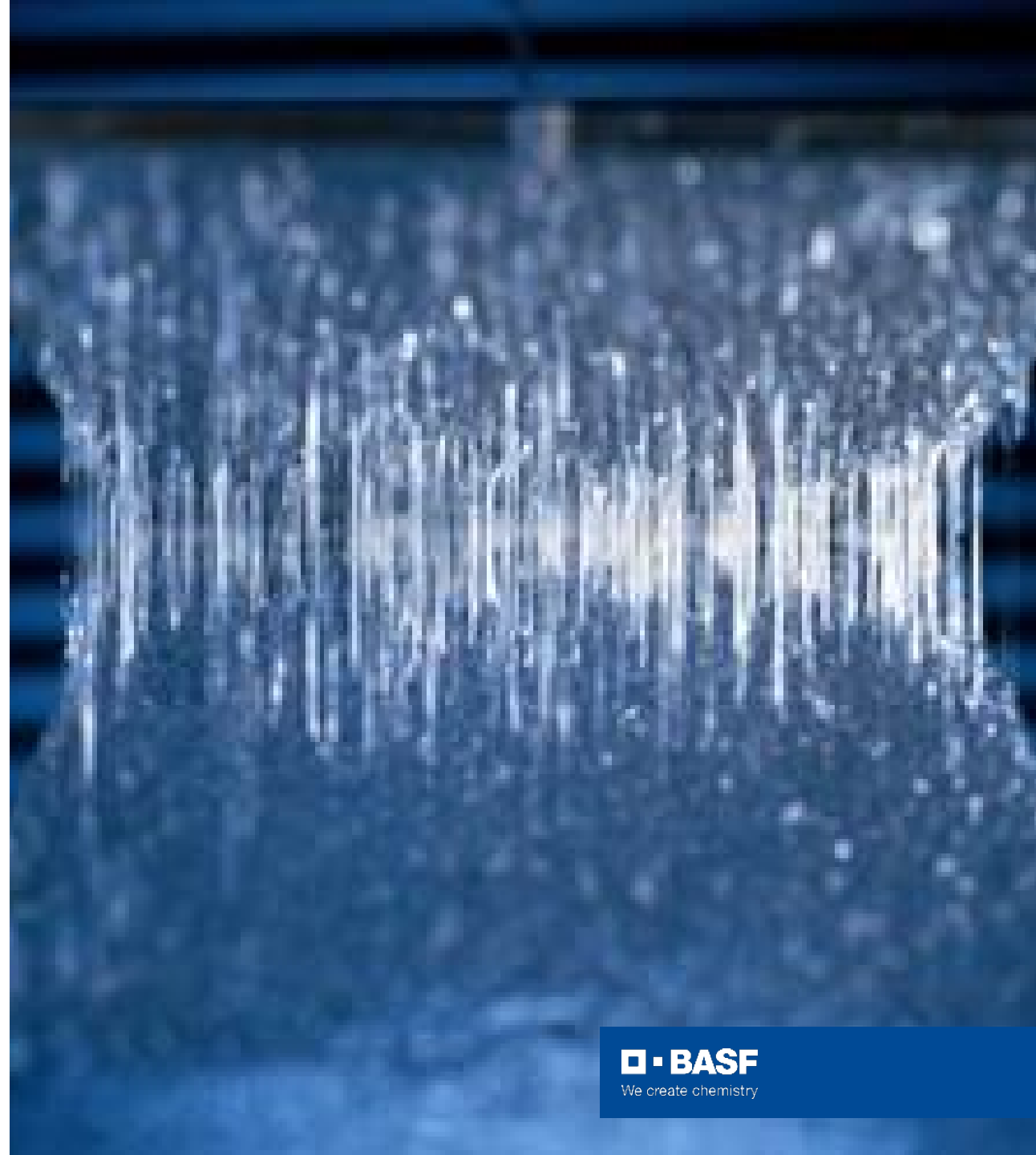


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Summary

- Loxanol[®] MI adhesion promoters are working best if applied as primer.
- Less is more. A very thin coating works best.
- There are grades with food contact status available (100% and 50%).
- It is possible to use specific Loxanol[®] MI adhesion promoter in the formulation, but it is not making best use of the material.



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There is more to come...

Next series of Webinars starting June 3rd / 4th

Formulation Additives for improved adhesion: **June 3 & 4**

Alternatives to Tinuvin 328: **June 9 & 10**

Formulation Additives for interior paints: **June 17 & 18**

Formulation Additives for composites: **June 24 & 25**

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