

Evaluation KETJENFLEX® 8 in Lamination Inks

Adhesion bond, Heat stability, Colorant compatibility

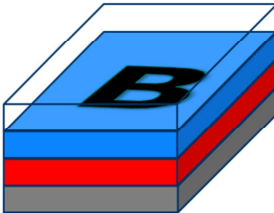
KETJENFLEX® 8 is a renowned plasticizer and gloss enhancer in the ink industry. This study shows KETJENFLEX® 8 acts as adhesion promotor in lamination inks built from various colors.

Multiwall packaging systems are built from multiple layers of plastic film brought together via lamination. On the inside of the top film also called the protective laminate the ink is reverse printed.

In this study we have evaluated the inks containing KETJENFLEX® 8 on:

- Adhesion bond between layers
- Ink compatibility of various colors (white, yellow, magenta, cyan and black concentrates)
- Heat stability of the laminate

According to below picture we have prepared two laminates: (1) PET to BOPP¹ and (2) BOPP to BOPP.



Type	1	2
Protective laminate	PMMA treated PET	BOPP
Ink	NC/PU Ink	NC/PU Ink
Adhesive	Coim Novacote SF PU	Coim Novacote SF PU
Base layer	OPP	OPP

The 2K adhesive (COIM Novacote SF PU) was applied to the base layer and the laminates were put together and cured.

Method

- Ink at 6 µm applied on Protective laminate by wire wound bar
- 1.6 µm film weight of Coim Novacote SF PU adhesive applied to unprinted OPP base layer
- Lamination of Protective laminate – PU coated baselayer
- Cure for 1 week at room temperature

The purpose of the first test was to compare KETJENFLEX® 8 (form. 1) vs 'standard' Dioctylsebacate (form. 2) as plasticizer.

The table on the next page shows the two ink formulations. In the case of form. 1 with KETJENFLEX® 8 as plasticizer the high bond (or tensile) strength of the lamination system caused film tear. With form. 2 based on DOS the films were relatively easily debonded at a force of 120g/m². Results are depicted for PET to BOPP and BOPP to BOPP laminates.

¹ PET: Polyethylene terephthalate; BOPP: Biaxially oriented polypropylene

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NC/PU ink for Lamination	Form. 1	Form. 2	Function
TR 52 Titanium oxide Paste	34	34	Colorpaste
Surkopak 5255 Polyurethane resin	8	8	Flexible resin system
DLX 3/5 Nitrocellulose (in ethanol)	50	50	Resin system
KETJENFLEX® 8	4		Plasticizer/adhesion promotor
Diocetylsebacate (DOS)		4	Plasticizer
N-propyl alcohol	4	4	Solvents
	100	100	
Results			
Tensile Strength 25mm strip	Film tear	120g/m ²	(180° peel PET-BOPP)
Tensile Strength 25mm strip	Film tear	120g/m ²	(180° peel BOPP-BOPP)

The tests were repeated with the use of different color pastes. The color pastes were made according to below recipe.

	Yellow Concentrate	Magenta Concentrate	Cyan Concentrate	Black Concentrate
ZE14R113 Chips	33.3			
ZE14R333 Chips		33.3		
ZE14R517 Chips			33.3	
ZE14R969 Chips				33.3
TSDA	44.4	44.4	44.4	44.4
Ethyl Acetate	22.3	22.3	22.3	22.3
	100	100	100	100

From these concentrates NC/PU inks were made and tested on their adhesive film strength after being applied on the PET protective layer, followed by lamination with a 2K PU adhesive to the BOPP base layer.

	Yellow Ink	Magenta Ink	Cyan Ink	Black Ink
Concentrate	34	34	34	34
Nitrocellulose varnish	50	50	50	50
PU resin	8	8	8	8
KETJENFLEX® 8	3	3	3	3
Ethanol	5	5	5	5
	100	100	100	100
Results				
Tensile Strength 25mm strip ¹⁾ (PET-BOPP)	Film tear	Film tear	Film tear	Film tear
Tensile Strength 25mm strip ¹⁾ (BOPP-BOPP)	Film tear	Film tear	Film tear	Film tear
Heated with clamp till 160°C	Pass	Pass	Pass	Pass

¹⁾ 180° Peel

The table shows that over a broad range of colors, the ink formulations with KETJENFLEX® 8 show excellent compatibility and strong adhesive bonds in both PET-BOPP and BOPP-BOPP laminates. The formulations are heat resistant up to 160°C by clamptest.

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