The white coating influence on print quality for metallic substrates

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Research aims

- Possible quality characteristics
- White layer according ISO 12647-2 PT2 ?
- (PSO) quality of process ink solids ?
- Tone gradation and colorimetric characteristics of images printed on different white layers

Substrates + inks

- Ink:

  white Inor Pantone 45 by SunChemical

  CMYK Foils 44 by SunChemical
- Substrate:

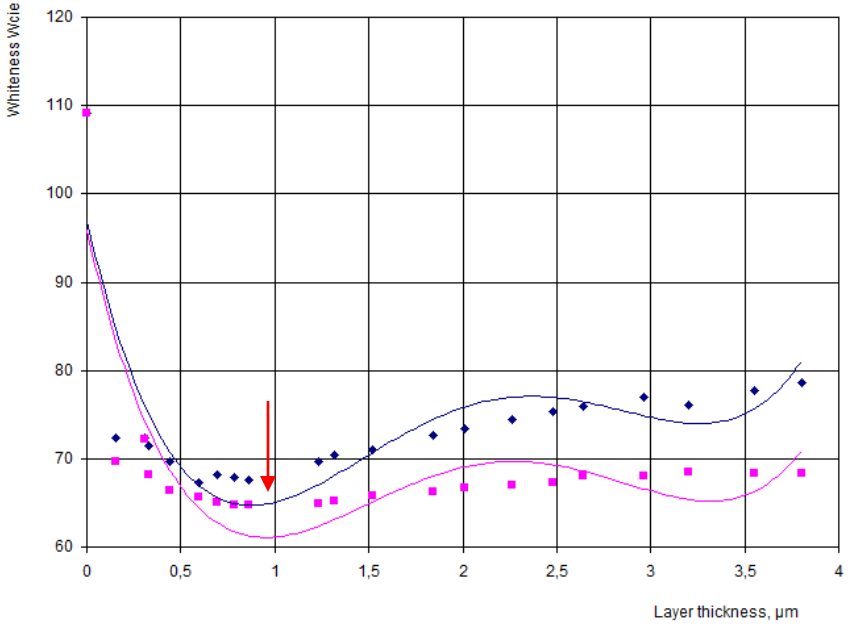
  metallic paper smooth 120 g/sqm

  textured label 80 g/sqm

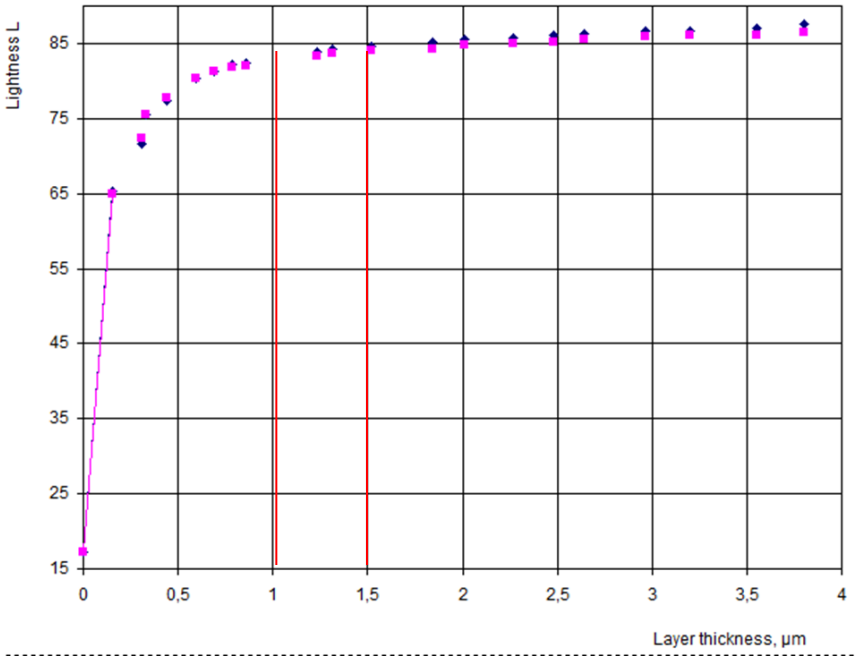
First experimental part

- Prüfbau printability tester
- White ink on metallic paper substrate; measurement on wet and dried layer
- Process inks on single and double printed dried white layer

Whiteness to white ink layer thickness



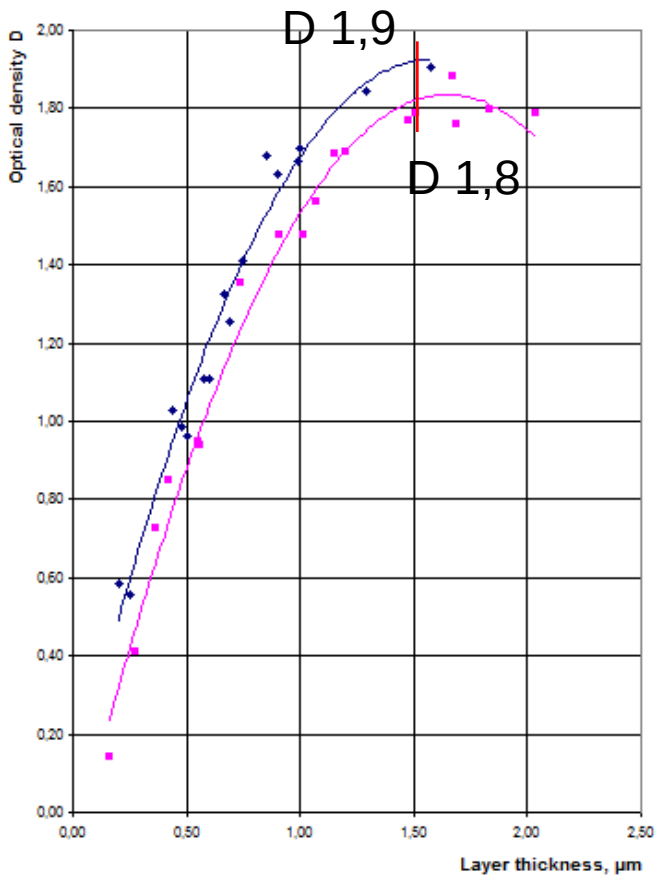
Lightness to white ink layer thickness

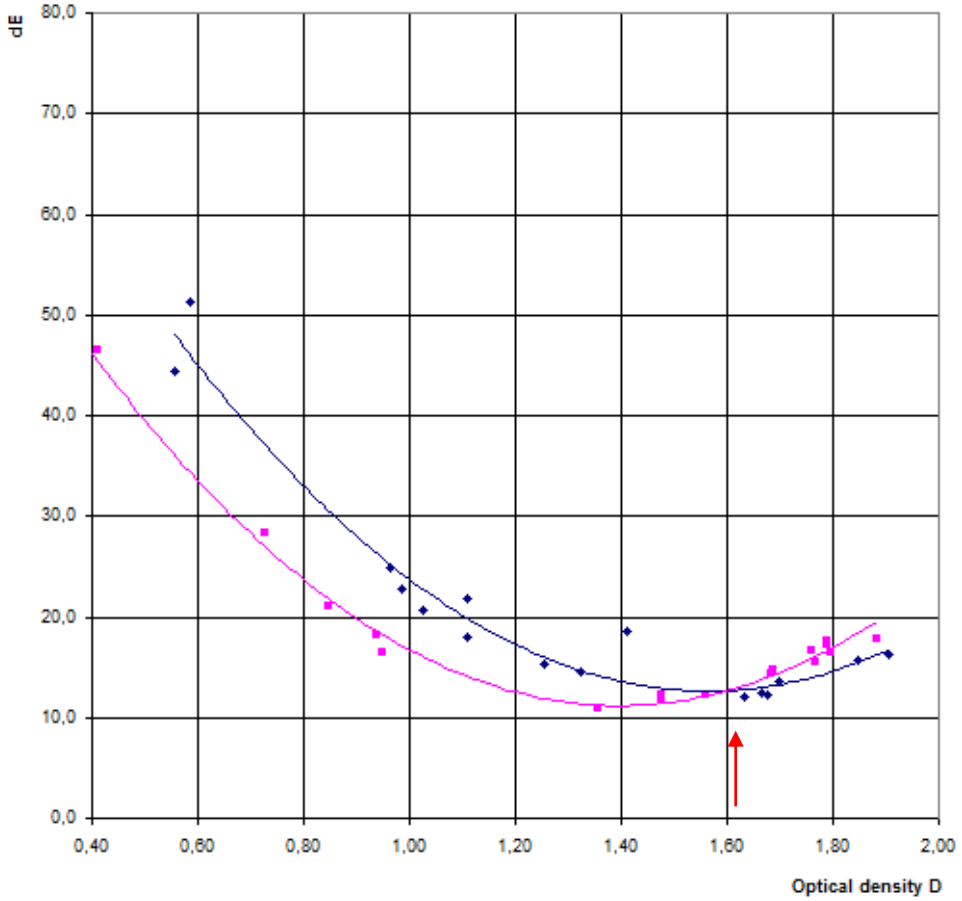


◆ **wet ink**

■ **dry ink**

YELLOW: color difference to density and density to ink layer thickness

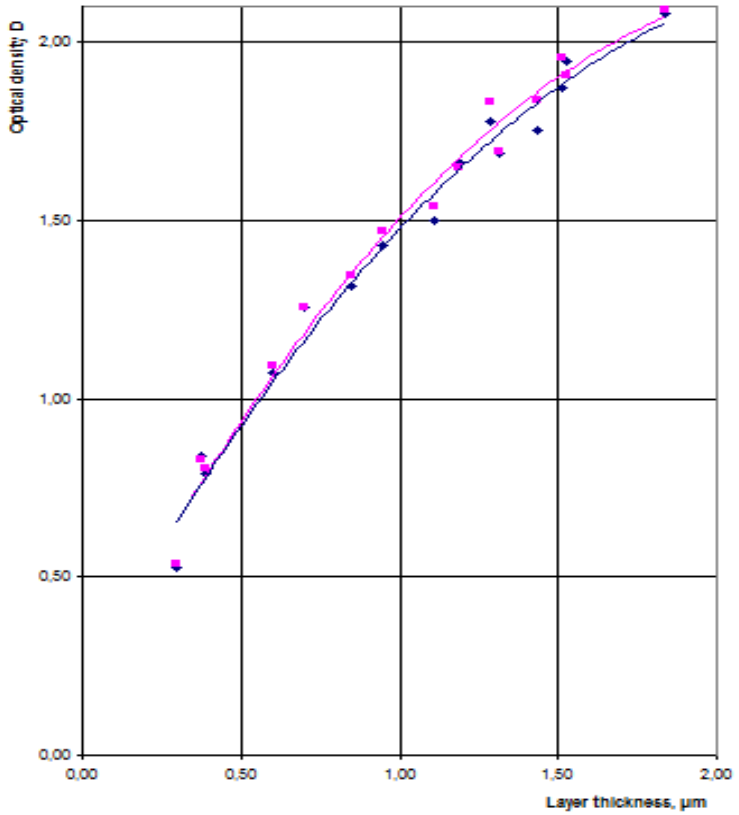


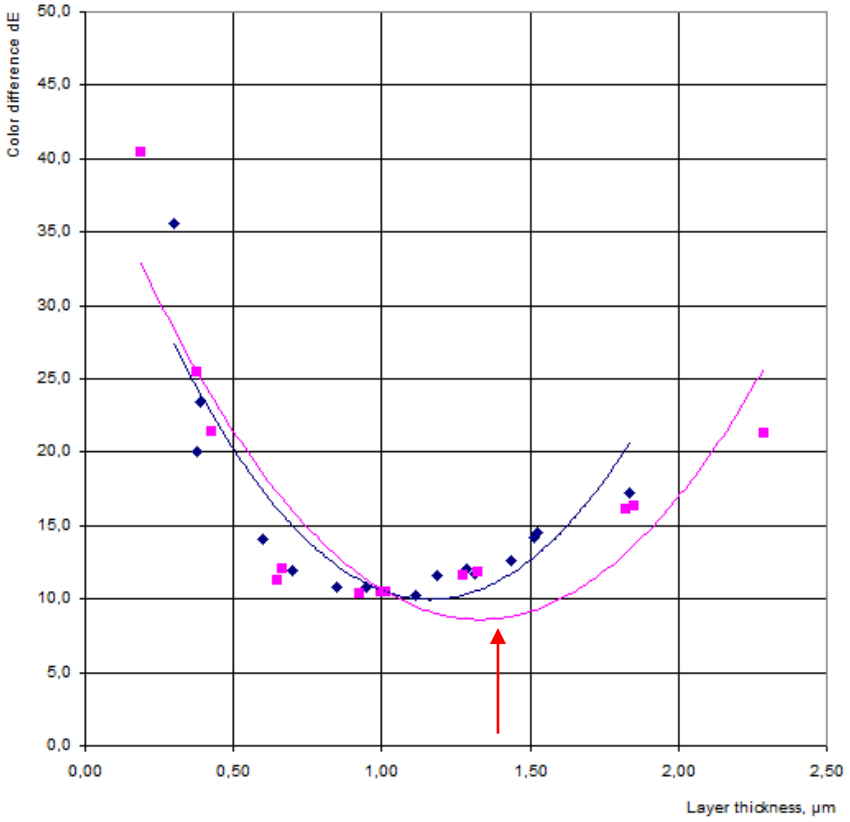


◆ single layer

■ double layer

MAGENTA: color difference to density and density to ink layer thickness

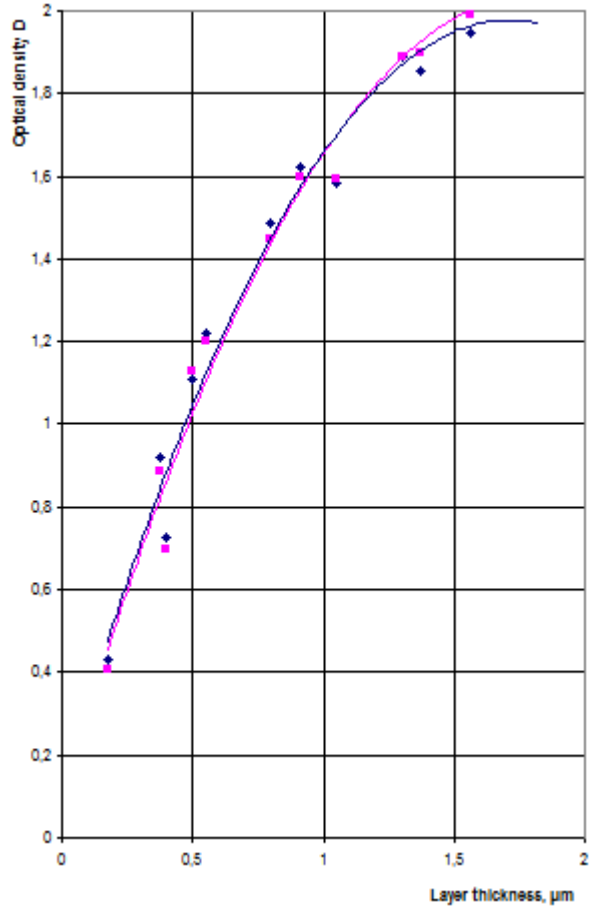


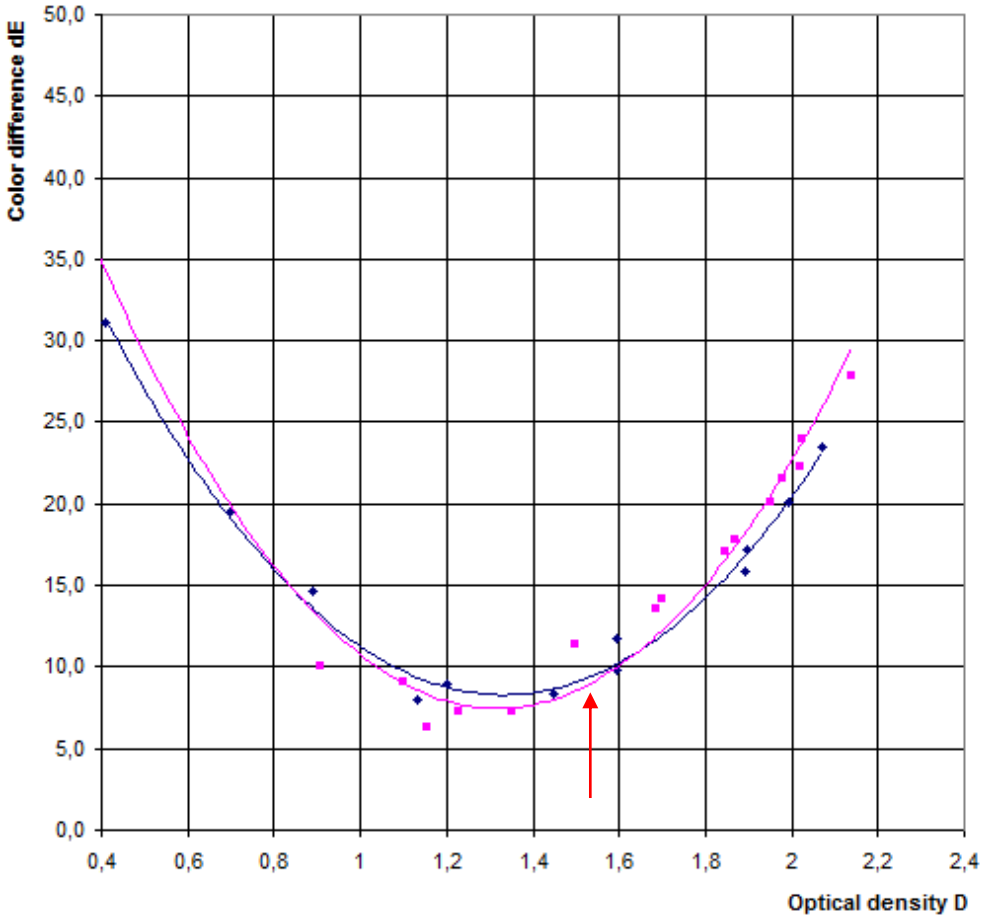


◆ single layer

■ double layer

CYAN: color difference to density and density to ink layer thickness

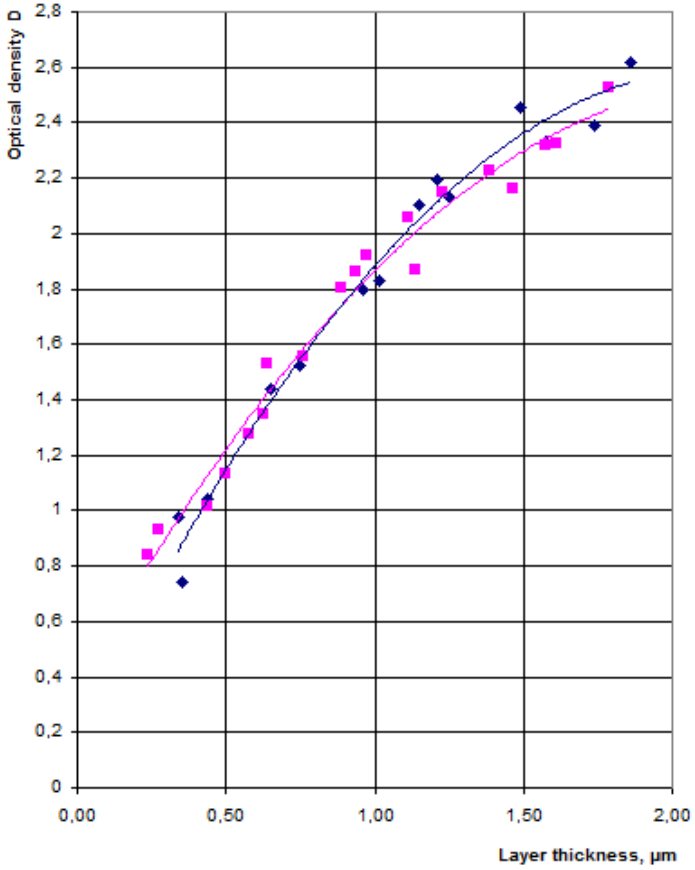


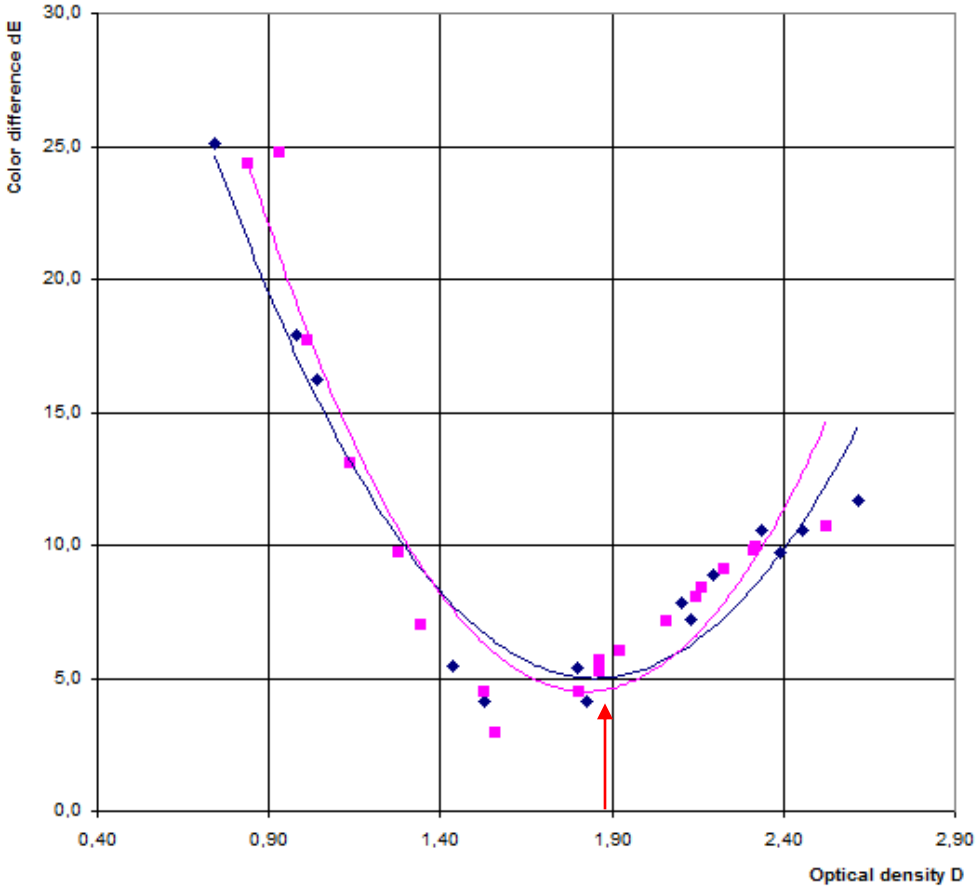


◆ single layer

■ double layer

BLACK: color difference to density and density to ink layer thickness





◆ single layer

■ double layer

Second experimental part

Coating sequences

- 1: Single white layer → drying → CMYK
- 2: Double white layer → drying → CMYK
- 3: Single white layer + CMYK wet-in-wet (in one pass)

Heidelberg Speedmaster XL 75-5+L

Printing conditions

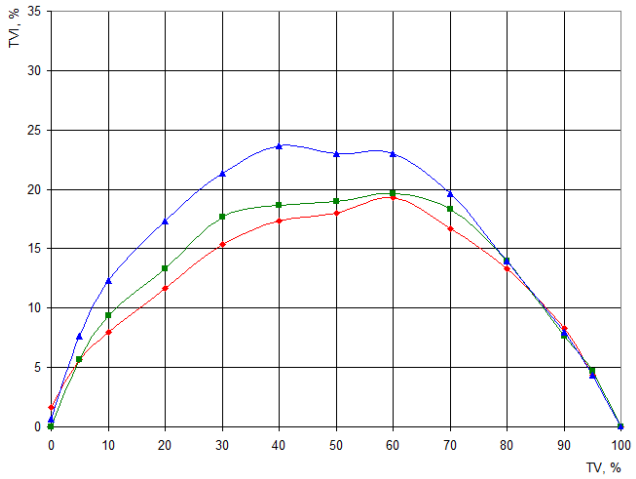
- Heidelberg Speedmaster XL 75-5+L
- Speed 8000 sheets per hour
- Fountain solution: pH 5.3

  1400 µS/cm

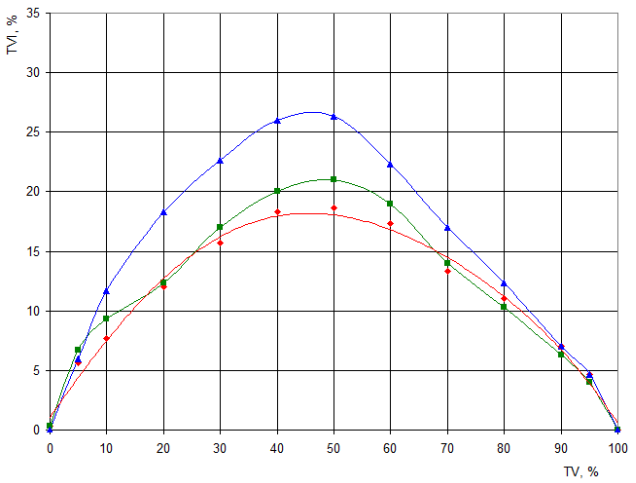
  IPA 10 %

  temperature 8ºC

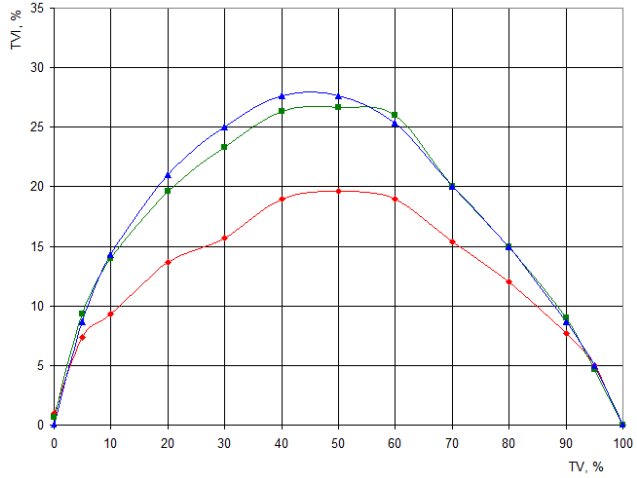
Tone value increase curves



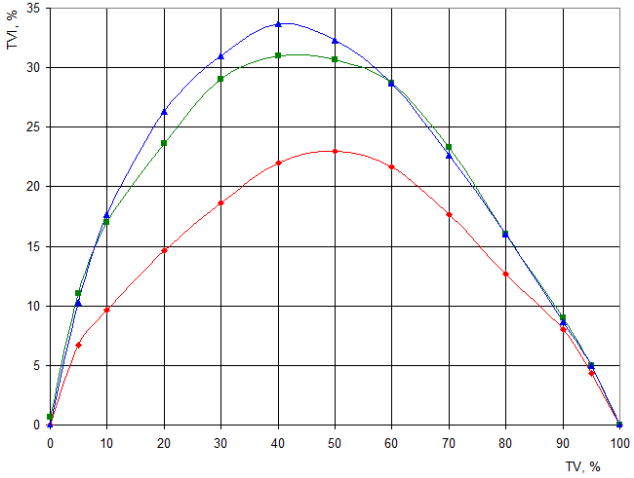
Yellow



Cyan



Magenta



Black

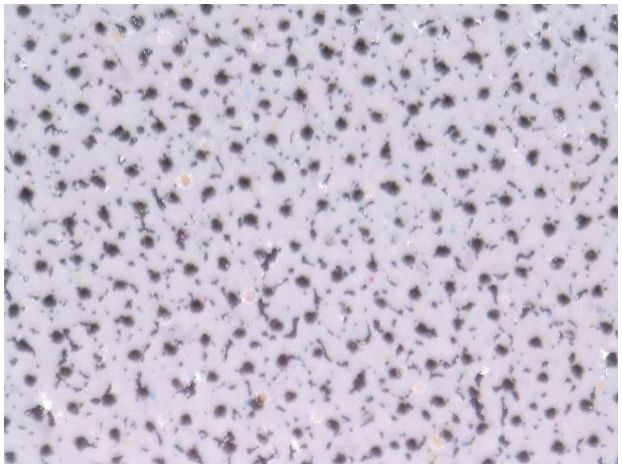
◆ **1: single layer** ■ **2: double layer** ▲ **3: wet-in-wet**

Tone value increase

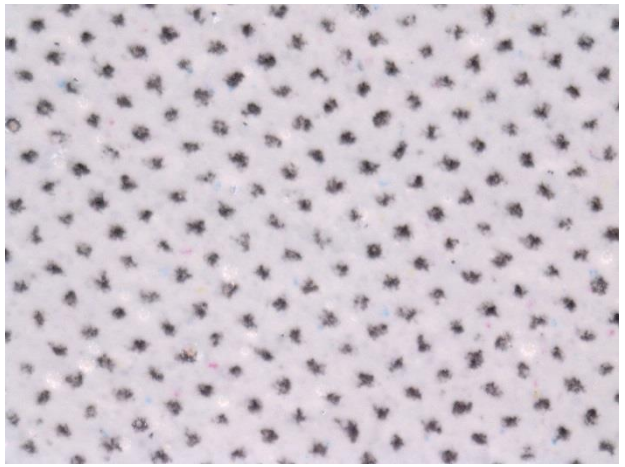
Tone 40%	cyan	magenta	yellow	*ISO 12647-2*	black	*ISO 12647-2*
1: single white layer	18,3	20,8	13,5	*9-17*	22,7	*12-20*
2: double white layer	24,8	30,0	17,0		38,7	
3: wet-in-wet	32,2	30,7	26,4		39,2	

Tone 80%	cyan	magenta	yellow	*ISO 12647-2*	black	*ISO 12647-2*
1: single white layer	8,5	14,2	16,1	*9-14*	12,9	*11-16*
2: double white layer	12,5	15,5	12,4		17,9	
3: wet-in-wet	15,3	13,2	17,6		16,0	

5% dots on white ink layer by 200x magnification



1



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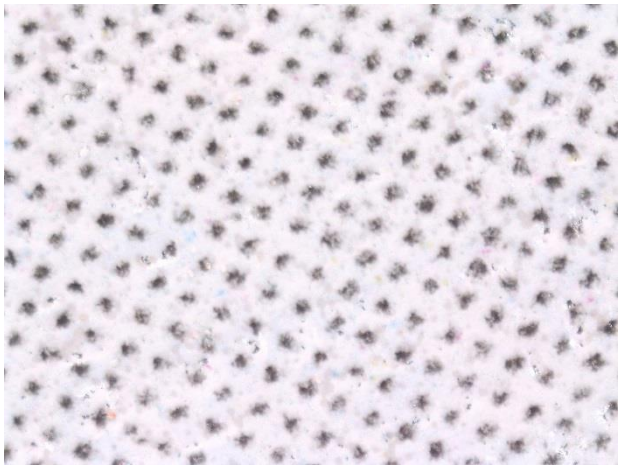

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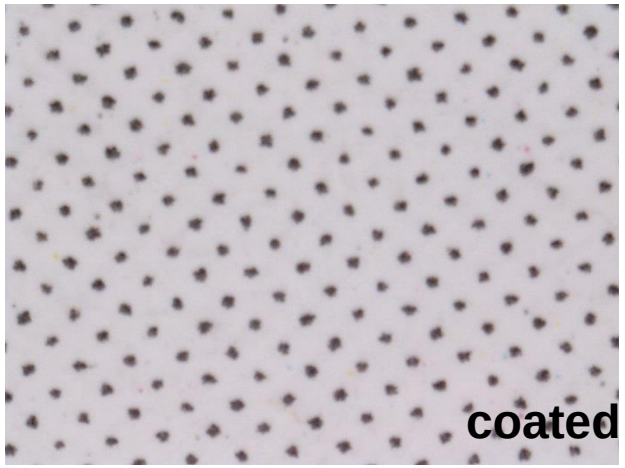
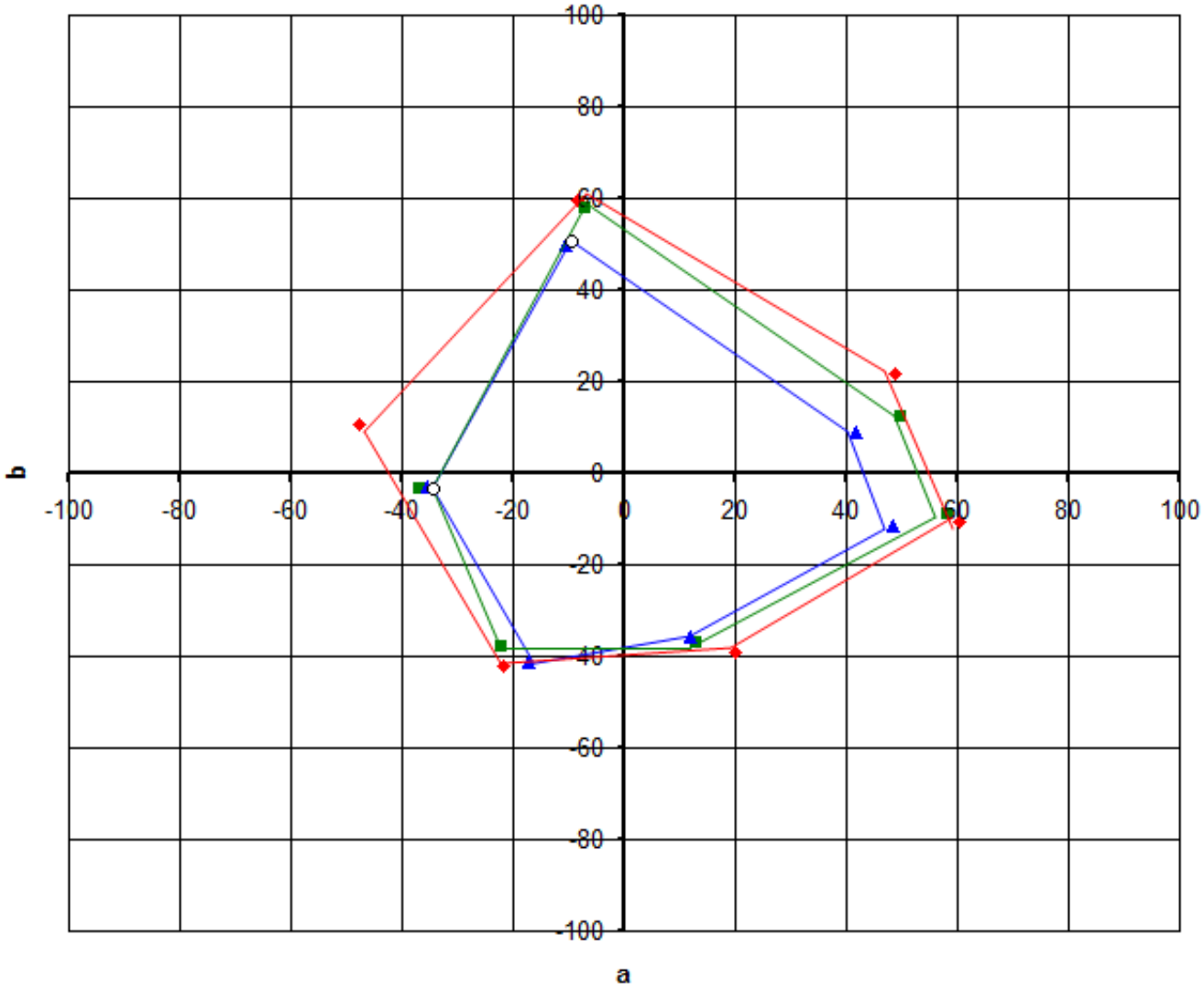


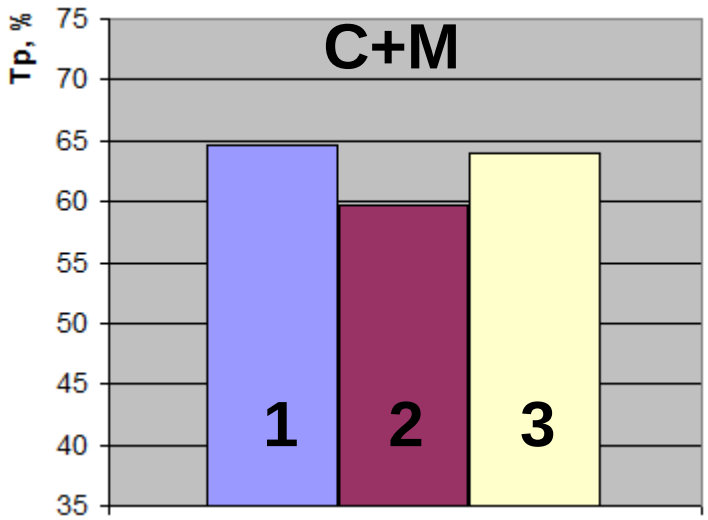
coated paper

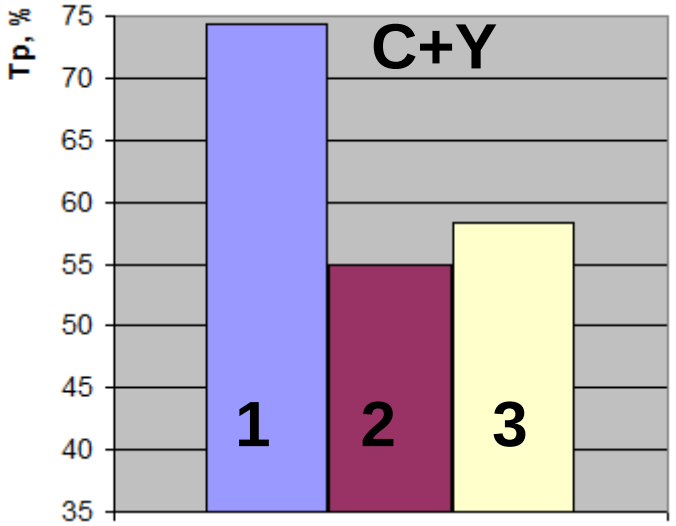
Color gamut

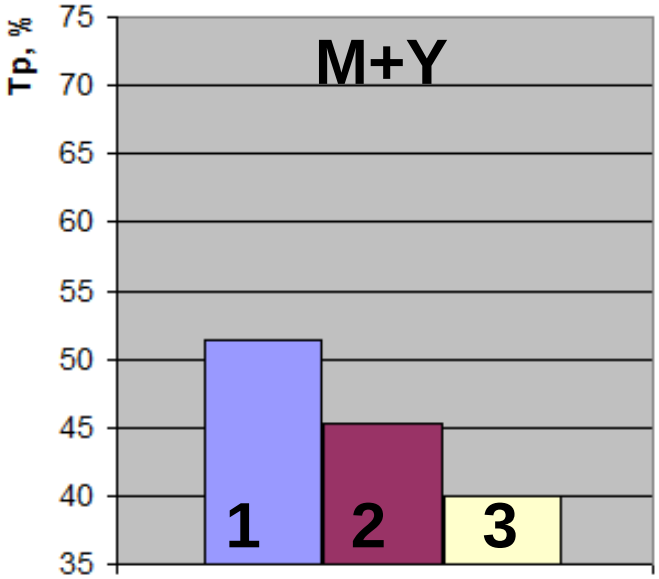


◆ 1: single layer ■ 2: double layer ▲ 3: wet-in-wet

Trapping (Preucil formula)







Grey balance

Coating sequences	Color difference dE		
	Lights	Midtones	Shadows
1: single white layer	**2,1**	**5,7**	**7,2**
2: double white layer	**5,8**	**26,1**	**23,0**
3: wet-in-wet	**4,0**	**8,2**	**12,2**

Conclusions

- Possible to print with white ink thickness 1-3 µm and CMYK inks thickness 1-1,5 µm
- Strong substrate influence on color, TVI, trapping
- Ink behavior on white layer is different to paper ➪ need more research
- Quality:

  single layer >> wet-in-wet > double layer


Thank you!