CINKARNA

TECHNICAL TRAINING

TiO_2 GRADES

CINKARNA

DURABLE GRADE

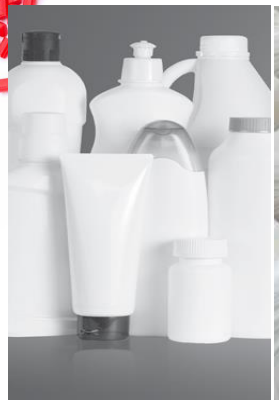
PRINTING INKS GRADE

TiO_2

ARCHITECTURAL PAINTS AND INKS

PLASTIC GRADE

DECO GRADE



Fields of application	RC 82	RC 823	RC 833	RC 813	RC 84	RC 86	RC 819	RC 87
PAINTS AND COATINGS								
Dispersion paints	○	○	○		●	●		
Primers	○	●	●		●			
Wallpaper coatings		●			●	●		
High gloss dispersions		●	●	●				
Silicon paints					●			
Silicate paints and plasters	○		○		●	○		
Plaster paints		○			●	○		
Plaster paints based on synthetic resins	○		●		●	○		
Mastics and sealants	○				●	○		
Road marking paints	●	○	○					
COATINGS								
Industrial and decorative coatings (water and solvent base)	○	●	●	●				
Coil-Coatings			●	●				
Domestic appliance finishes			●	●				
Package lacquers		●		●				
Radiator paints			●	●				
POWDER COATINGS								
Interior	●	○						
Exterior	●	○	●					

Fields of application	RC 82	RC 823	RC 833	RC 813	RC 84	RC 86	RC 819	RC 87
PRINTING INKS								
Printing inks			○	●	○	○	●	
PLASTICS								
PVC-hard interior			○				●	
Masterbatches		○		○			●	
PAPER AND LAMINATES								
Carton-paper coatings	●			●		○		
Coloured decorative papers	○				○			●
Laminates								●
ENAMEL – CERAMICS								
Electrodes	○							
Tiles	○							
OTHER APPLICATIONS								
Levelling products		○			○	○		
White concrete	●			○	○			

ESPECIALLY RECOMMENDED ● RECOMMENDED ○

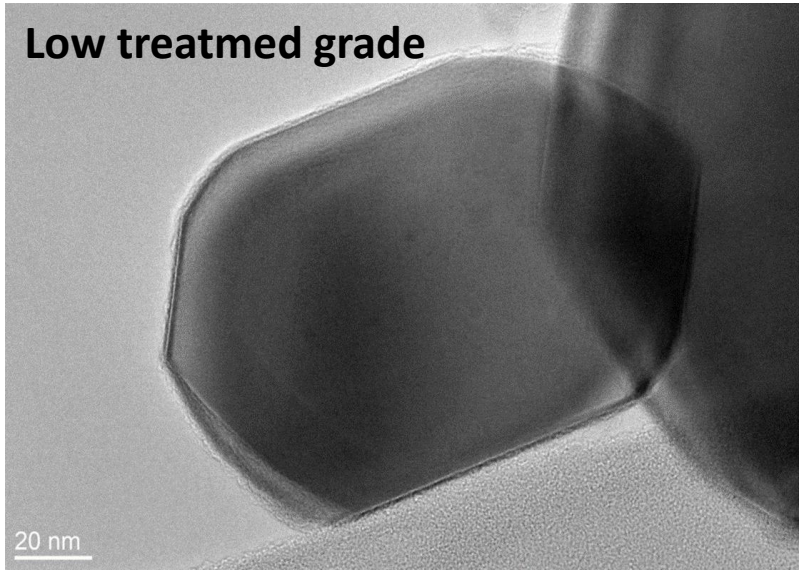
Why different contents of TiO_2?

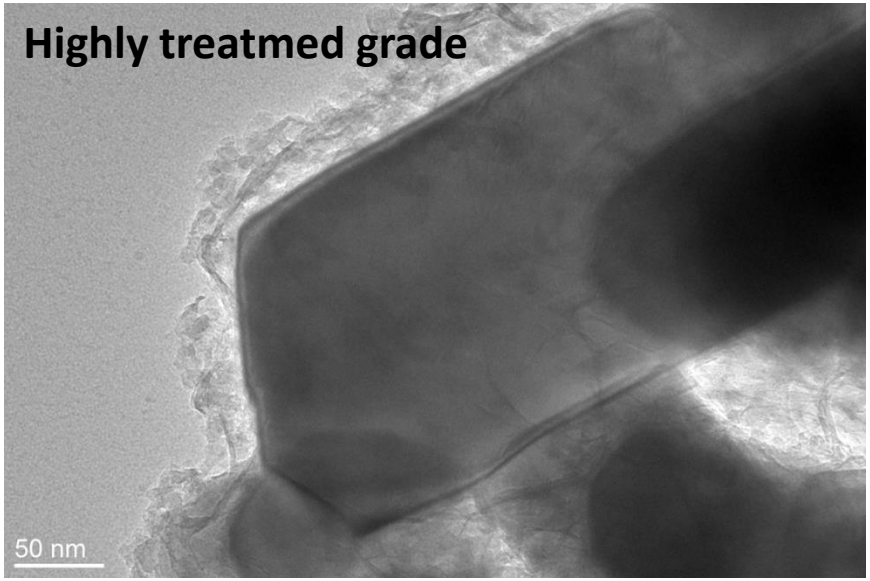
- Since the proportions of surface treatments are different for different types of pigment (e.g. RC 819 = 1.1 % Al_2O_3, RC 86 = 4.5% Al_2O_3 + 10 % SiO_2), the TiO_2 content is different.

- According to the ISO 591-1:2000 standard, there are three types of pigment based on TiO2 content: R1=<97%, R2=90-97%, R3=80-90%.

- Even in the case of certain grade of pigment, the proportion of TiO_2 can change, because in the internal specifications in the Control Plan we have set the upper and lower limits of the proportions of surface treatment, e.g. RC 82: Al_2O_3 = 2.8+/-0.2% and SiO_2 = 0.8 +/- 0.1%.

Inorganic surface treatment





- The amount and composition of the inorganic surface treatment must be properly selected according to the application.

- Grade and level of surface treatment of the pigment determines the degree of photoactivity. For example, for outdoor weather resistant coatings, the use of rutile TiO_2 grade with a high percentage of alumina, silicon and/or zirconium is recommended.

COATING GRADE
RC 82 & RC 823

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Technical Data Sheet

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TITANIUM DIOXIDE RC 82

Type

RC 82 is a micronized rutile pigment produced by the sulphate process by CINKARNA CELJE - SLOVENIA. The pigment is lattice-stabilized with alumina and surface-treated with aluminium and silicon compounds.

Applications

- dispersion paints,
- industrial and decorative coatings,
- primers,
- wallpaper coatings
- plaster paints based on synthetic resins,
- road marking paints,
- powder coatings,
- coloured decorative papers,
- carton-paper coatings,
- electrodes,
- tiles.

Technical data parameter

TiO_2 content	min 94.0 %	ISO 591-1*
Classification	R2	ISO 591
Oil absorption	18 – 21 g/100 g	ISO 787-5
Loss on drying at 105 °C **	max 0.5 %	ISO 787-2
pH	7.0 – 8.0	ISO 787-9
Sieve residue (µm40)	max 0.01 %	ISO 787-7
CIE Lab (powder)		
L*	min 97.5	Internal Method
b*	max 2.5	Internal Method

* - XRF determination controlled by ISO 591-1

** - at packing

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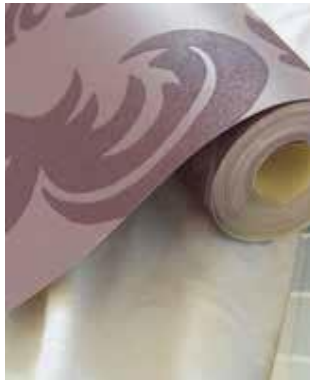
Technical Data Sheet

ARHITECTURAL PAINTS
RC 84 & RC 86

Hidding power

TITANIUM DIOXIDE RC 86

Type

RC 86 is a micronized rutile pigment produced by the sulphate process in Cinkarna Celje, Slovenia. The pigment is lattice – stabilized with alumina and surface treated with aluminium and silicon compounds. The pigment is high surface treated and enhance an excellent hiding power, high durability so as light and weather stability, especially in high PVC and excellent dispersibility.

Applications

- dispersion paints (interior and exterior)
- aqueous and solvent flat paints – low gloss
- paper coatings with outstanding dry flat hiding effect
- wallpaper coatings
- silicon paints

Technical data parameter

TiO_2 content	min 80.0 %	ISO 591-1*
Classification	R3	ISO 591
Oil absorption	36 g/100 g – 43 g/100g	ISO 787-5
Loss on drying at 105 °C **	max 1.5 %	ISO 787-2
pH	8.0 – 9.5	ISO 787-9
Sieve residue (µm40)	max 0.01 %	ISO 787-7
CIE Lab (powder)		
L*	min 98.0	Internal Method
b*	max 2.0	Internal Method

* - XRF determination controlled by ISO 591-1

** - at packing

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ARHITECTURAL PAINTS
RC 84

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TITANIUM DIOXIDE RC 84

Type

RC 84 is a micronized rutile pigment produced by the sulphate process by CINKARNA CELJE - SLOVENIA. The pigment is lattice-stabilized with alumina and surface-treated with aluminium and silicon compounds. In comparison with RC 82 the pigment shows better light and weather stability also by external use especially by higher PVC range.

Applications

- dispersion paints (interior and exterior),
- wallpaper coatings,
- plasters,
- plaster paints,
- plaster paints based on synthetic resins,
- silicate paints and plasters,
- silicon paints,
- levelling products,
- mastics and sealants,
- carton-paper coatings,
- road marking paints,
- white concrete,
- electrodes.

Technical data parameter

TiO_2 content	min 88.0 %	ISO 591-1*
Classification	R3	ISO 591
Oil absorption	23 – 26 g/100 g	ISO 787-5
Loss on drying at 105 °C **	max 1.0 %	ISO 787-2
pH	7.0 – 8.5	ISO 787-9
Sieve residue (µm40)	max 0.01 %	ISO 787-7
CIE Lab (powder)		
L*	min 98.0	Internal Method
b*	max 2.2	Internal Method

* - XRF determination controlled by ISO 591-1

** - at packing

Packaging

- 25 kg multiply paper sacks, packed 40 sacks per pallet, wrapped with stretch-hood foil, suitable for recycling.
- Big bags up to 1000 kg
- Bulk road tankers containing up to 23 t by request.

ABOUT RC 833

TiO_2 content	min 94.0 %	ISO 591-1*
Classification	R2	ISO 591
Oil absorption	max 21 g/100 g	ISO 787-5
Loss on drying at 105 °C **	max 0.5 %	ISO 787-2
pH	7.0 – 8.0	ISO 787-9
Sieve residue (µm40)	max 0.01 %	ISO 787-7
CIE Lab (powder)		
L*	min 97.5	Internal method
b*	max 2.5	Internal method

* - XRF determination controlled by ISO 591-1

** - at packing

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TITANIUM DIOXIDE RC 833

Type

RC 833 is a micronized rutile pigment produced by CINKARNA CELJE - SLOVENIA. The pigment is lattice-stabilized with alumina and surface-treated with aluminium and zirconium compounds. The pigment RC 833 possesses enhanced hydrophilic properties due to a special organic treatment. It belongs to the "HIGH-DURABILITY" - class.

Applications

- dispersion paints (exterior, interior),
- industrial and decorative coatings (water and solvent base),
- high gloss dispersions,
- radiator paints,
- coil-coatings,
- domestic appliance finishes,
- powder coatings (exterior, interior),
- plaster paints,
- plaster paints based on synthetic resins,
- printing inks.

Technical data parameter

TiO_2 content	min 94.0 %	ISO 591-1*
Classification	R2	ISO 591
Oil absorption	max 21 g/100 g	ISO 787-5
Loss on drying at 105 °C **	max 0.5 %	ISO 787-2
pH	7.0 – 8.0	ISO 787-9
Sieve residue (µm40)	max 0.01 %	ISO 787-7
CIE Lab (powder)		
L*	min 97.5	Internal Method
b*	max 2.5	Internal Method

* - XRF determination controlled by ISO 591-1

** - at packing

Packaging

- 25 kg multiply paper sacks, packed 40 sacks per pallet, wrapped with stretch-hood foil, suitable for recycling.
- Big bags up to 1000 kg
- Bulk road tankers containing up to 23 t by request.

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Analytical report of final lots RC 833

Služba kakovosti
Pigmentni laboratorij
Odjemalec: PE Titanov dioksid

POROČILO O PRESKUSU za pigment titanov dioksid - RC 833
obdobje 01.07. - 31.07.2024

				PRAH												BELI ALKIDNI PREMAZ		SIVI ALKIDNI PREMAZ			PRAH: KEMIJSKA SESTAVA								ALKIDNA PASTA	
				pH	W10	L*	b*	LOD 105 °C	p.o.	s.o. (40 um)	Dv (50)	Razpon	< 1,0 um	S BET		RD 30°	Sijaj 20°	dL*	db*	dE*	w(TiO2)	R	Al2O3	Fe	P2O5	K2O	ZrO2	Pb	Prvo zrno	Finoča
				7.0 - 8.0	87.0 - 92.0	97.50 - 100.00	1.00 - 2.50	0.00 - 0.50	18.0 - 21.0	0.000 - 0.010	0.42 - 0.52	1.48 - 1.62	90.00 - 95.00	15 - 19		5 - 11	74.0 - 80.0	-0.3 - 0.3	-0.3 - 0.3	0.0 - 1.0	94.0 - 99.0	98 - 100	3.0 - 3.4	0.001 - 0.005	0.00 - 0.30	0.000 - 0.300	0.3 - 0.5	0.0000 - 0.0030	0.0 - 35.0	0.0 - 15.0
datum	lot	ev. št. (količina)	prevzem					%	g/100 g	%	um		%	m2/g		um					%	%	%	%	%	%	%	%	um	um
01.07.	05524 [1]	41000/24 (120 t)	✓	7.9	88.2	98.0	1.5	0.7		0.000						10	80	0.5	0.0	0.5	94.7 [2]	99.8	3.5	0.0010	0.19	0.015	0.37			
	05724	40984/24 (120 t)	✓	7.7	88.7	98.1	1.5	0.4		0.002						12	80	0.5	0.0	0.5	94.7 [2]	99.5	3.5	0.0013	0.19	0.013	0.38			
	05524 [1]	(120 t)	✓					0.5 [3]																						
02.07.	05624	41233/24 (125 t)	✓	7.6	88.6	98.3	1.6	0.5	18	0.000						10	75	0.5	0.3	0.6	94.8 [2]	99.6	3.5	0.0011	0.19	0.013	0.37			
03.07.	05824	41473/24 (125 t)	✓	7.7	88.3	98.1	1.5	0.4		0.001						9	79	0.2	0.2	0.3	94.9 [2]	99.5	3.4	0.0017	0.19	0.012	0.37			
	05924	41487/24 (60 t)	✓	7.2	88.5	98.0	1.5	0.3		0.000						13	77	0.3	0.2	0.4	94.9 [2]	99.3	3.3	0.0020	0.19	0.011	0.37			
25.07.	06024 (1-30)	46482/24 (30 t)	✓	7.4 [4]	88.5	98.1	1.5	0.3	18	0.001											94.8 [2]									
26.07.	06024	46726/24 (120 t)	✓	7.3 [4]	88.5	98.1	1.5	0.4		0.000						10	79	0.4	0.1	0.4	94.8 [2]	99.4	3.4	<0.0010	0.19	0.011	0.39			
29.07.	06124	47358/24 (120 t)	✓	7.1 [4]	88.3	98.1	1.5	0.4	18	0.000	0.54	2.582	88	20.0		10	79	0.2	0.2	0.3	97.7 [2]	99.0	3.5	0.0011	0.19	0.0080	0.41	0.0020	41	7
30.07.	06324	47608/24 (100 t)	✓	7.1 [4]	88.6	98.2	1.5	0.4	18	0.001						10	81	0.1	0.2	0.2	94.8 [2]	99.1	3.5	<0.0010	0.19	0.0080	0.40			
31.07.	06224	47878/24 (125 t)	✓	7.2 [4]	87.7	98.0	1.6	0.4		0.000						10	77	0.0	0.2	0.2	94.8 [2]	99.3	3.4	<0.0010	0.19	0.0080	0.40			

Vrednosti normativov so izpisane iz Plana kontrole za pakiranje 1 - RC 833 (Gama system).
Datum: datum sprejema vzorca in datum pričetka izvajanja preskusov. Določitve W_{10}, L*, b*, ΔL*, Δb*, sijaj 20° v belem alkidnem premazu in ΔL*, Δb*, SR v sivem alkidnem premazu trajajo dva ali več dni.

Opombe:
1 Ponovno vzorčenje.
2 Normalizacija 99% oz. 98,5% pri RC 86.
3 Določitev v ponovnem vzorcu.
4 Pigment se ne poseda.



PRINTING INK GRADE RC 813

Opacity
Gloss

- Grinding technology and special surface treatment make it possible to produce printing inks using only high-speed mixers.
- Optimum mean particle size distribution leads to maximum opacity.
- Suitable for use in reverse and lamination printing.

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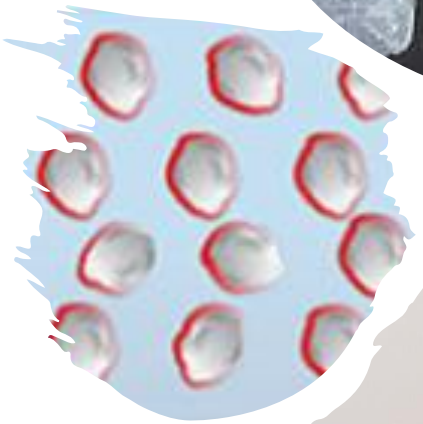
DEVELOPMENT OF GRADE FOR PRINTING INKS

with improved pigment performance

Parameters in focus:

- Opacity
- Dispersibility
- Gloss



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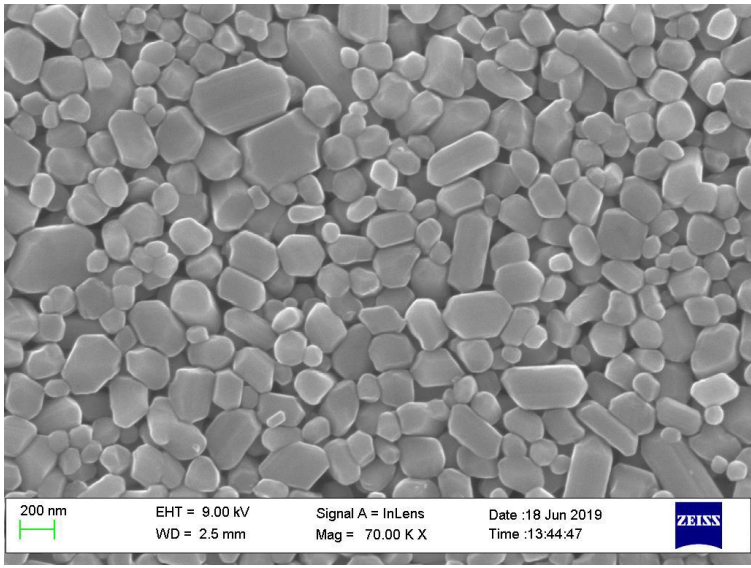
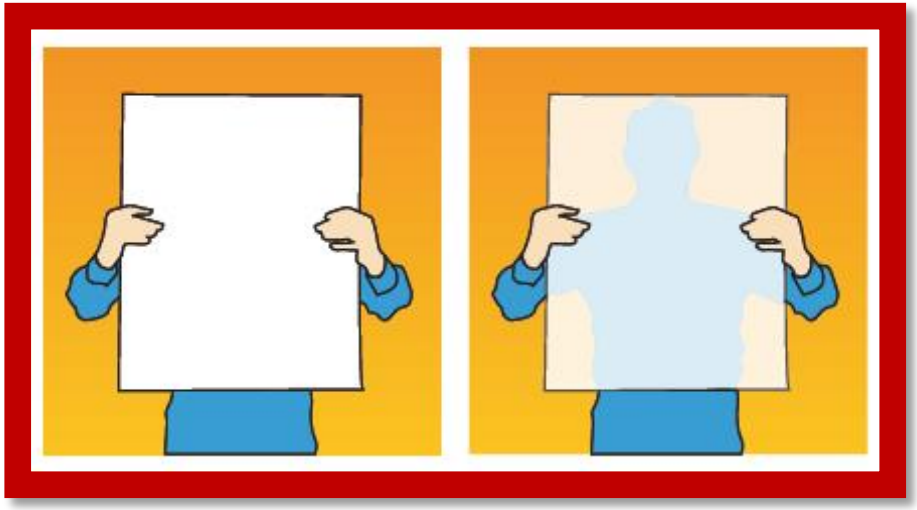
Main activities taken for achieving the goal:

1. Differentiation of base (to increase opacity)
2. Milling process (to improve gloss)
3. Surface treatment process (for higher dispersibility)

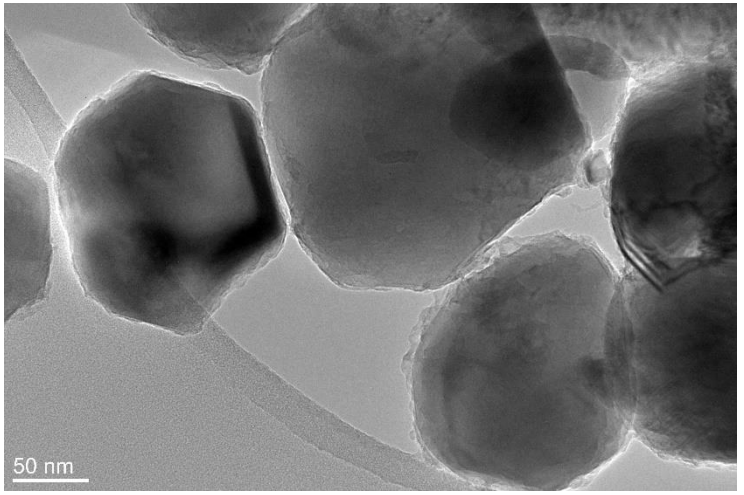
1



2



3



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SEM images of printing inks prints

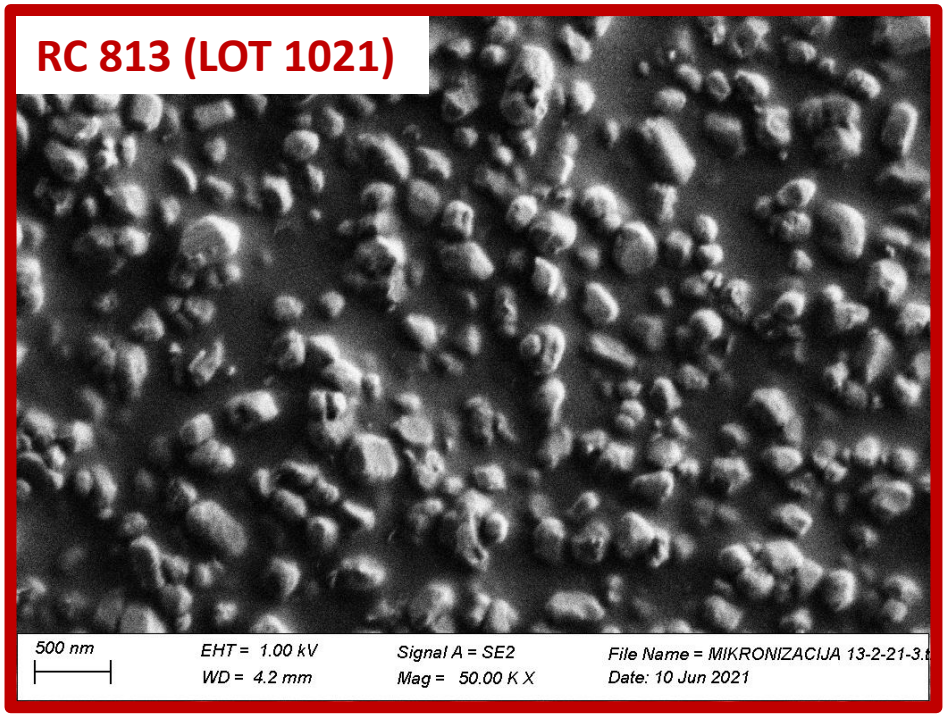
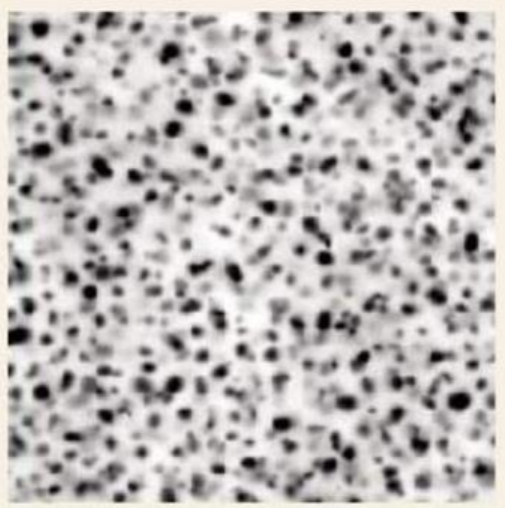
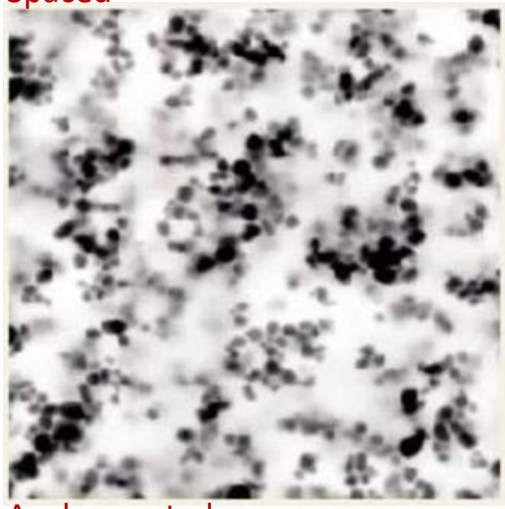


Figure: Scanning electron microscope (SEM) image shows even distribution of TiO_2 particles in the print of the ink, pigmented with particles with optimized surface modification. Better pigment dispersion results in improved optical properties of the prints.



Spaced



Agglomerated

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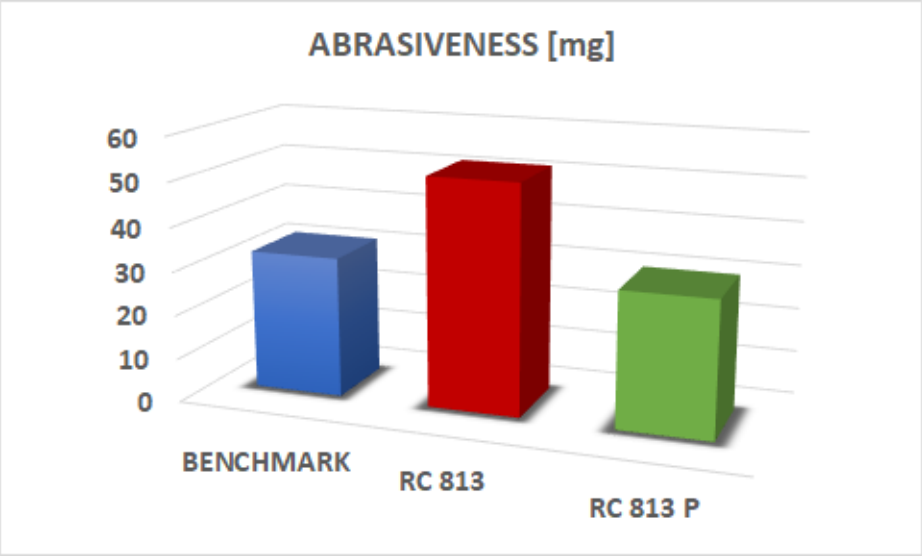
ABRASIVENESS

- RC 813 is significantly less abrasive compared to chloride types. Lower abrasiveness prolongs machine life, lowers printing costs and increases production efficiency.
- By implementation of intense grinding and milling processes, coarser particles are eliminated which results in lower abrasiveness.



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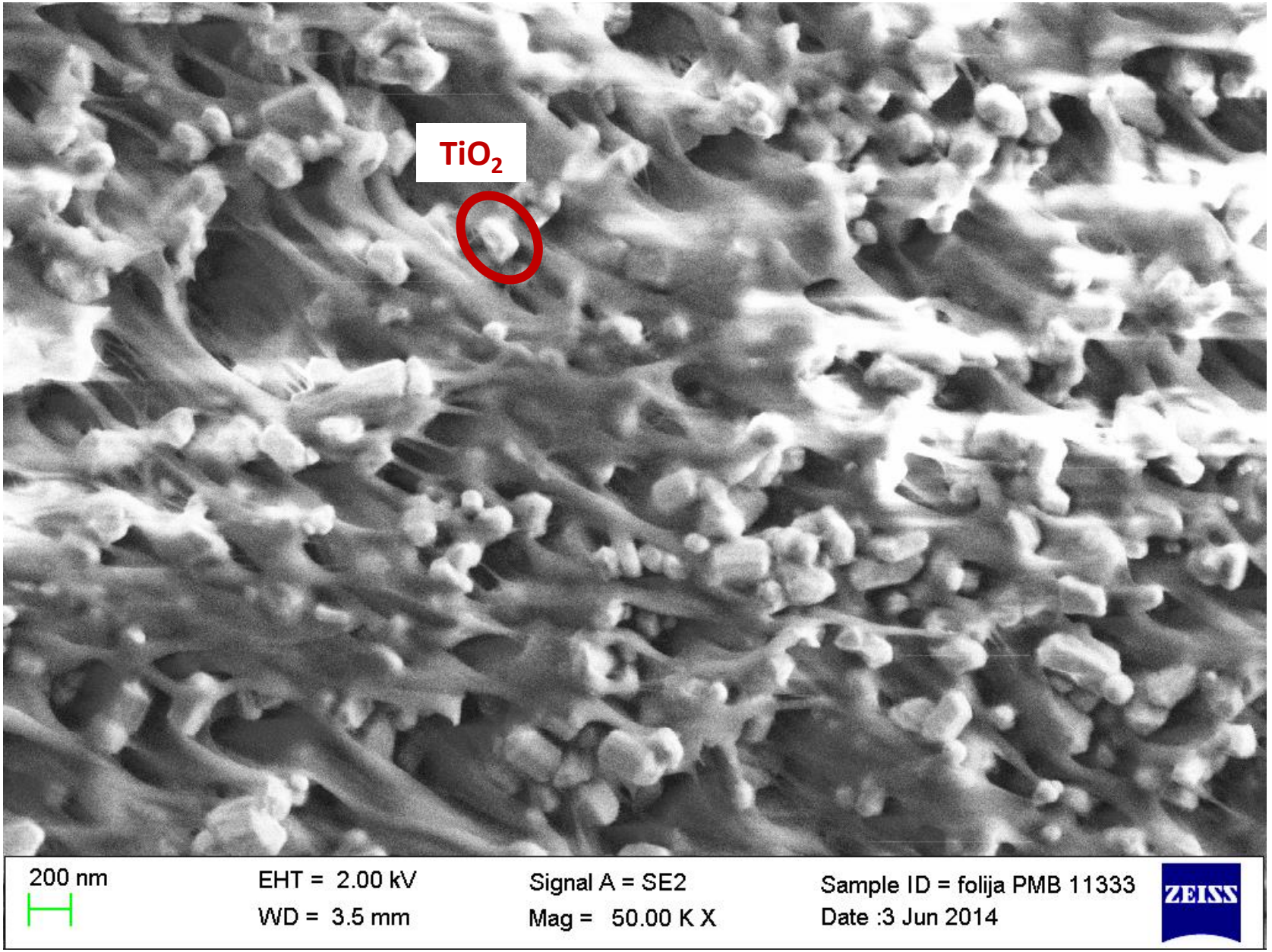
PLASTIC GRADE RC 819

- RC 819 pigment is designed specifically for use by the plastics industry.
- Its unique surface treatment ensures very easy dispersion.
- Excellent processing properties allows production of high quality products even at high pigment loadings.

Processability
Dispersibility



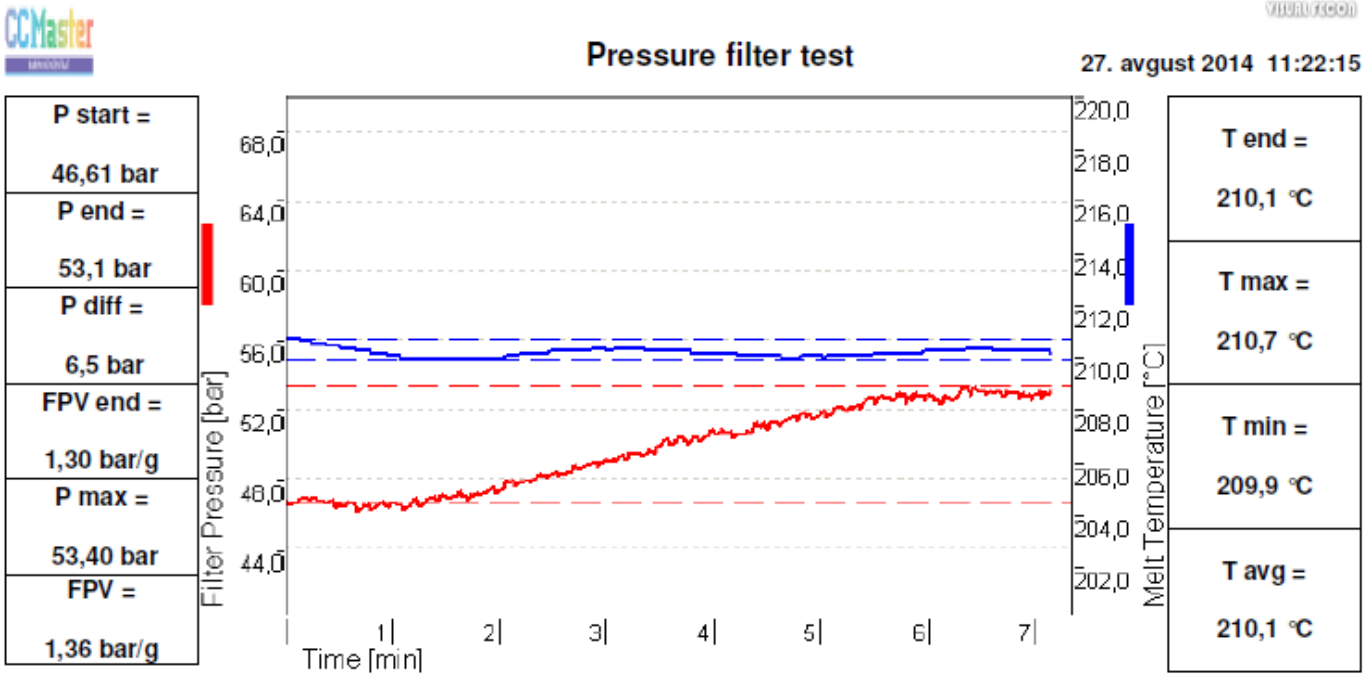
SEM image: Intersection of PE film with incorporated alumina&organic surface treated TiO_2 particles.

Filter pressure test

- Filter pressure test makes quantitive evaluation possible. The filter pressure value (FPV) describes the quality and dispersion of the pigments.
- The pressure index (PI) is a measure of the fineness of dispersion of pigments in a masterbatch.
- Low pressure index values (PI) stand for high dispersion quality.

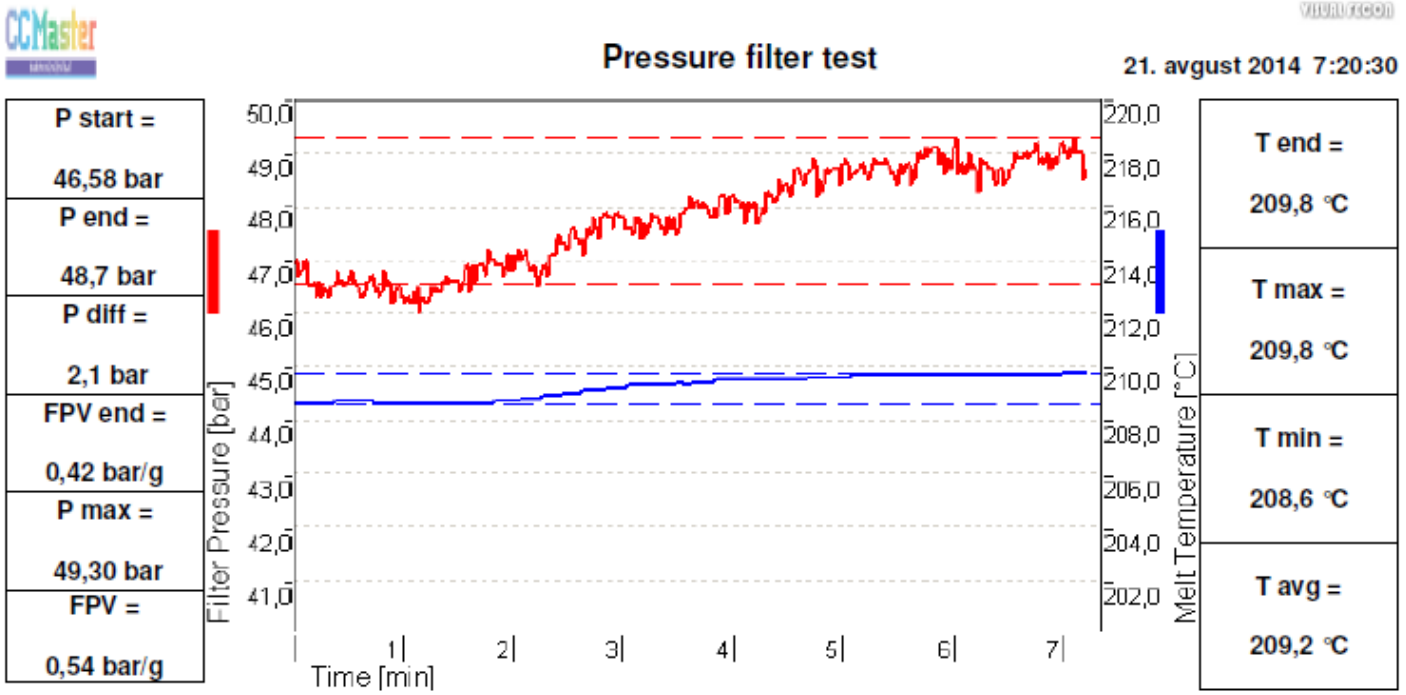
Filter pressure test - 1

FPV = 2.62 bar/g



Filter pressure test - 2

FPV = 0.54 bar/g



Organic surface treatment - Hydrophobization of TiO_2

Improve Compatibility & dispersion

Hydrophobic agent hydrophobizes the oxide surface so effectively that even the high density material as TiO_2 floats on water.

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DURABLE GRADE RC 859

Weather durability

- Special inorganic surface treatment provides increased weather durability of plastics.
- TiO_2 particles are encapsulated in a dense silicon oxide; to reduce photochemical activity; a “free radical catcher mechanism” is applied to neutralise any free radicals that can form.

Weather resistant grade

- Formation of dense SiO_2 coating is essential for higher protection against degradation caused by UV.

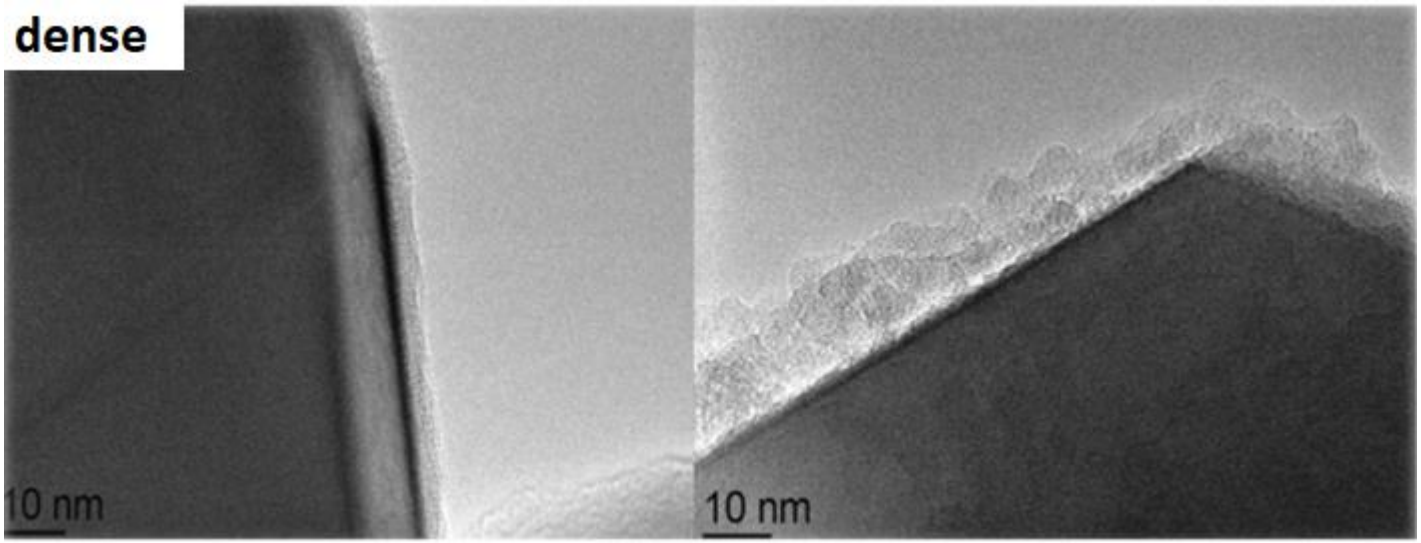
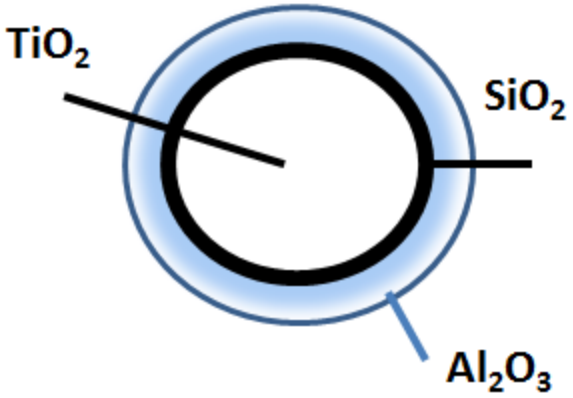


Figure: The same wt. % SiO_2, different pH conditions different coatings morphology



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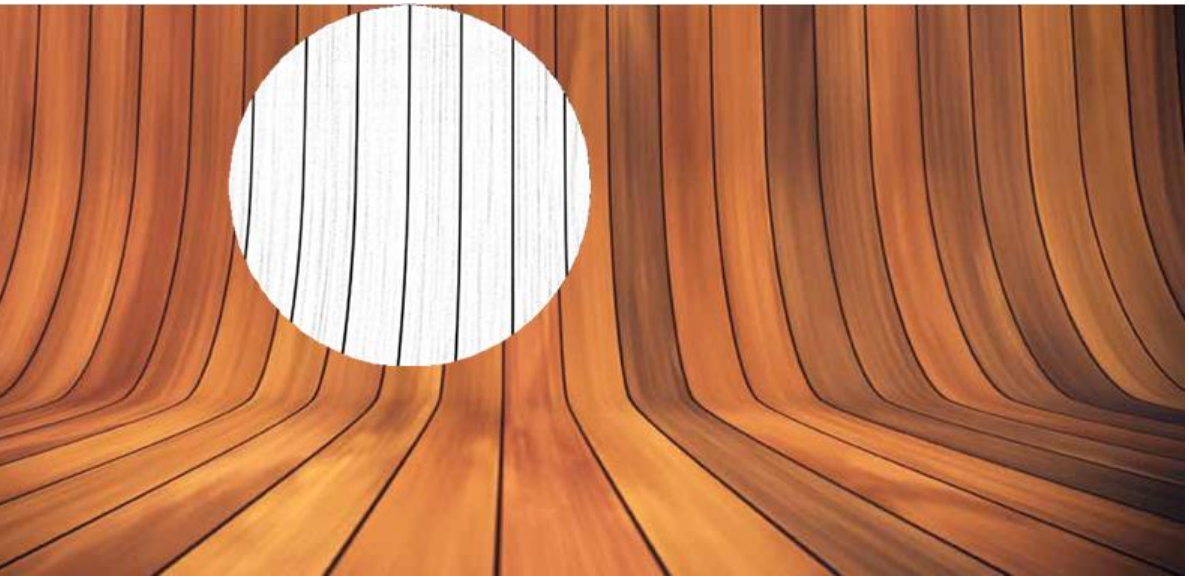


DECO GRADE RC 87

Opacity
Light fastness

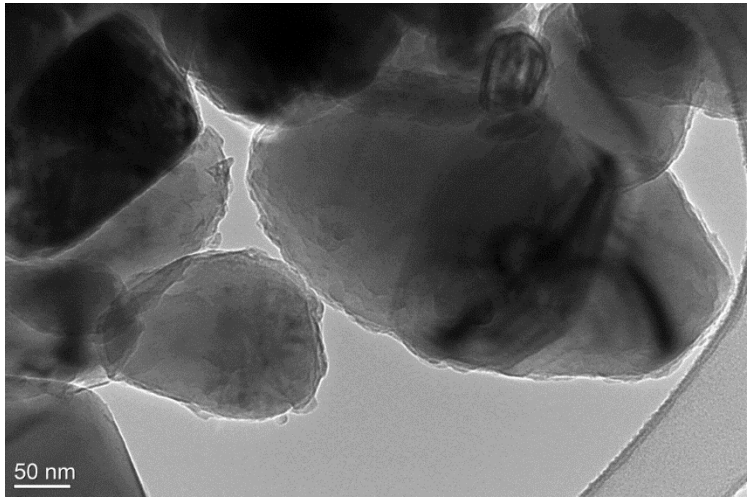
KEY PROPERTIES

- Surface treatment with aluminum oxide and phosphorus compounds ensures increased light fastness.
- An optimal mean particle size distribution leads to increased pigment retention in the pulp.

Light resistant grade

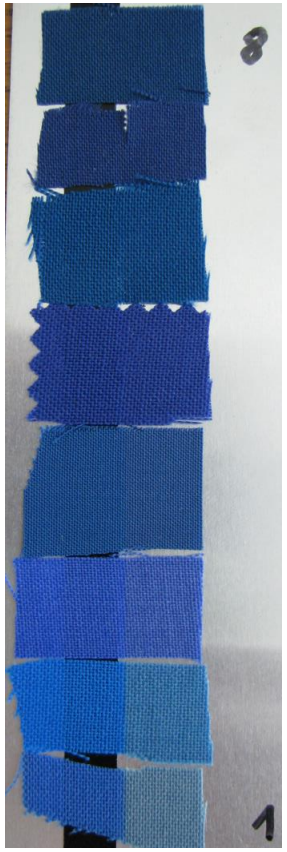
TiO_2 grade for applications in paper laminates

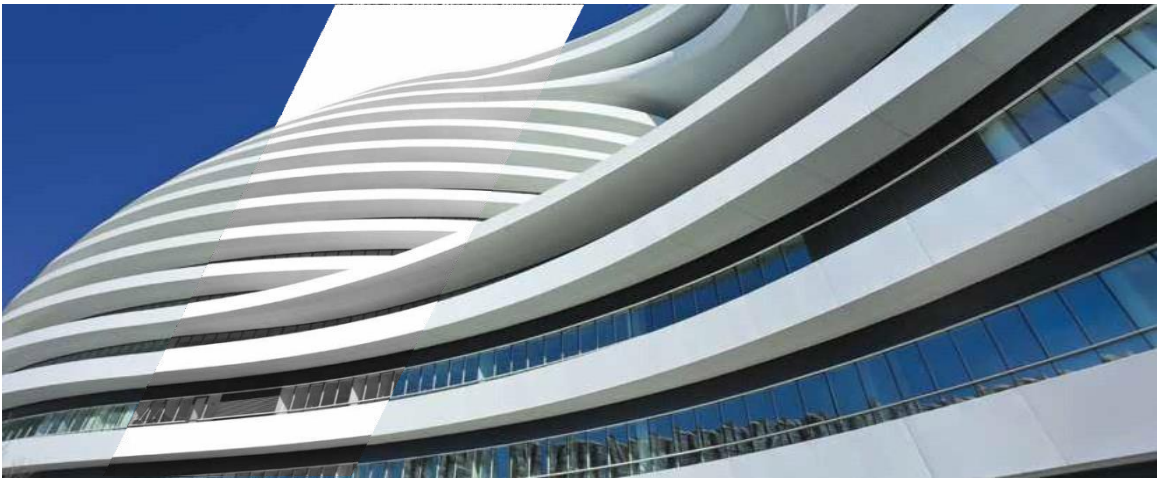
- The interaction of UV light with TiO_2 particle results in formation of Ti^{3+} centres which are violet coloured species. For that reason discoloration (greying) of the exposed area might be observed. This is usually described in terms of the light fastness.



Light fastness

The lightfastness is indicated by the grades on the Blue Wool Scale:
BWS 1 = poor, BWS 2 = low, BWS 3 = average, BWS 4 = rather good, BWS 5 = good, BWS 6 = very good, BWS 7 = extremely good, BWS 8 = excellent.





DURABLE GRADE RC 833

Weather durability

- Special inorganic surface treatment with alumina and zirconia ensures high outdoor durability when used in wide range of applications.

FIELDS OF APPLICATION

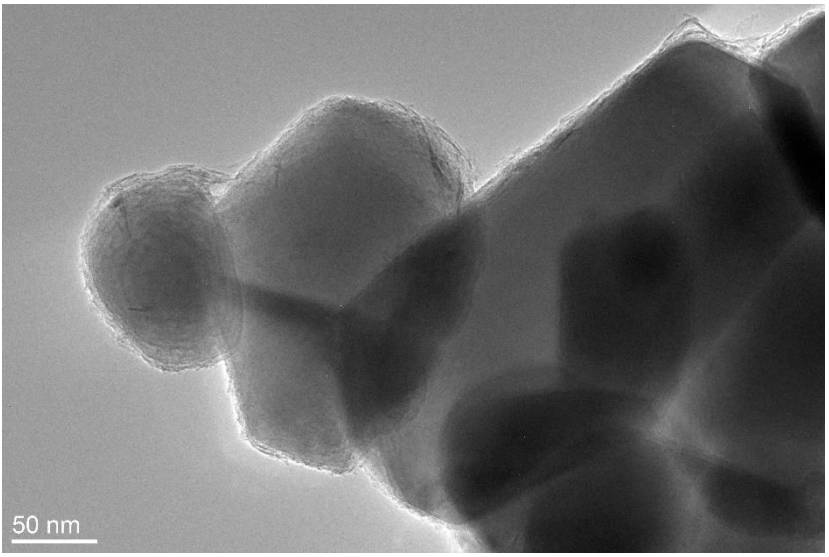
- Decorative coatings (water and solvent base),
- Dispersion paints (exterior, interior),
- Industrial coatings for wide range of applications.

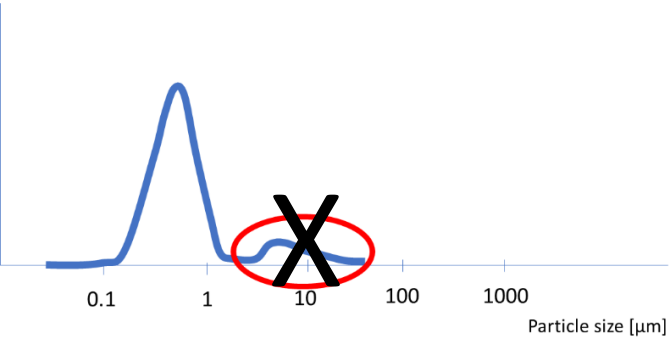


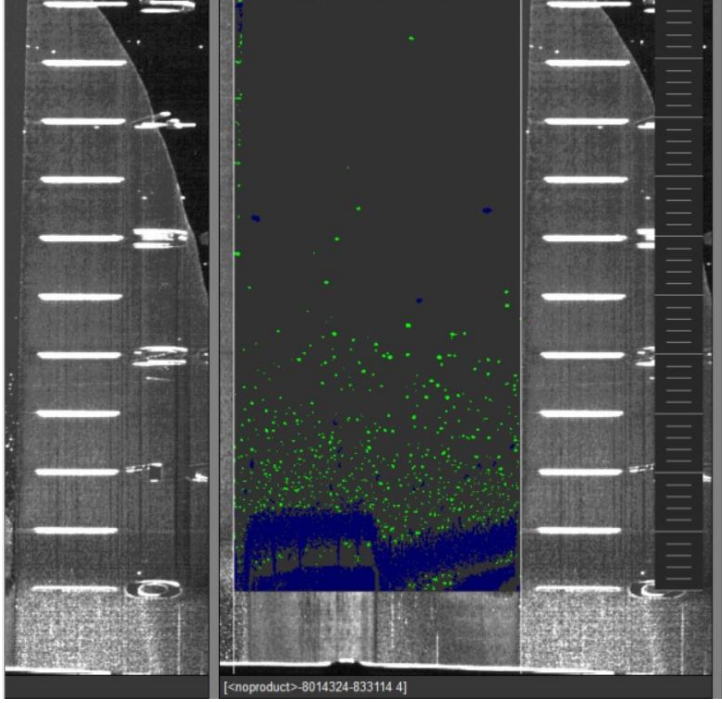

OPTIMIZED RC 833

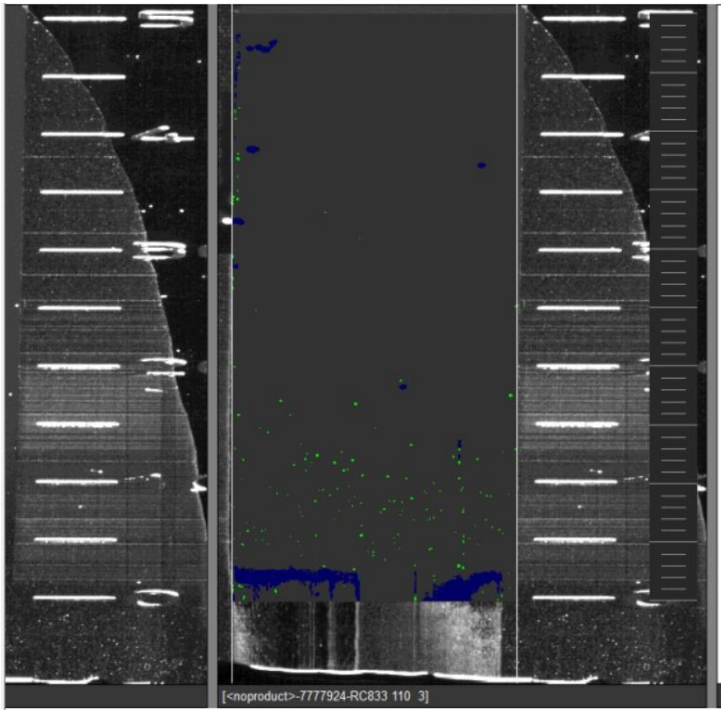
Key parameters in focus:

- dispersibility
- stability
- durability









Regulatory compliance challenges

- Our company makes a statement to our customers that TiO_2 pigments meet the purity requirements for coloring in packaging material for foodstuffs and other articles of daily use.
- **For that reason, all the components of the final pigment should have a Compliance with food contact regulations**.
- Regulative Requirements (e. g. **food contact status)** :
  - **EU-Regulation 10/2011**
  - **FDA** rules for Food Contact - Components of a food packaging material used in compliance with a regulation in 21 CFR

Products:

- RC 82
- RC 84
- RC 86
- RC 813
- RC 823
- RC 833

TMP FREE

- RC 813
- RC 823
- RC 833

CINKARNA

PACKAGING

Automatic packaging line with robot paletising

CINKARNA

Packaging - different forms of packaging


Thank you for your attention!