



PATCHAM



A SUSTAINABLE APPROACH TO  
MODERN COATING TECHNOLOGY



**FLOOR COATINGS**

# A Sustainable Approach to Modern Coating Technology

Patcham FZC is a well-established manufacturer of specialty additives headquartered in the United Arab Emirates. Since its inception, Patcham has steadily grown into a leading supplier of specialty additives for the Paint & Coatings, Ink, PVC and Composite industries.

The company's Pat-Add range of coating additives includes wetting & dispersing agents, defoamers, slip & leveling agents, rheology modifiers. Whilst keeping focus on environmental sustainability, the company produces products using green raw materials that are APEO free and have low or no VOC.

These products are multi functional and multi compatible, which simplifies the production process, reduces the chance of errors and minimizes inventory thus improving cost effectiveness.

Patcham has built a strong manufacturing and R&D infrastructure that enables the rapid transition from concept to products. The company has strategically located technical service laboratories, offices and representatives around the world to provide the most efficient customer service. In addition, a well-developed robust supply chain network enables it to deliver its products and services to customers around the globe with minimal lead-time.



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# Introduction

Recent trends in industrial floor coatings are towards seamless flooring which not only offers an aesthetic appearance (different colors, patterns, terrazzo etc.) but also ease of application, maintenance and long term performance.

The coating process can be hazardous if it contains VOCs like those used in conventional paints. The environmental concerns of solventborne systems have driven the development of solvent free coatings.

The formulations for the above coatings are pigmented and are called as co-grinding (3K) or 4K epoxy, polyurethane systems. Even though they have advantages over conventional coatings they have issues of in-can settling, foaming, inadequate wetting, poor workability and leveling. Patcham has developed a complete package of additives for PU, Epoxy and Polyaspartic solventborne and solvent free coatings. This includes wetting and dispersing agents based on High Molar Volume technology, leveling and defoaming/de-aeration additives.

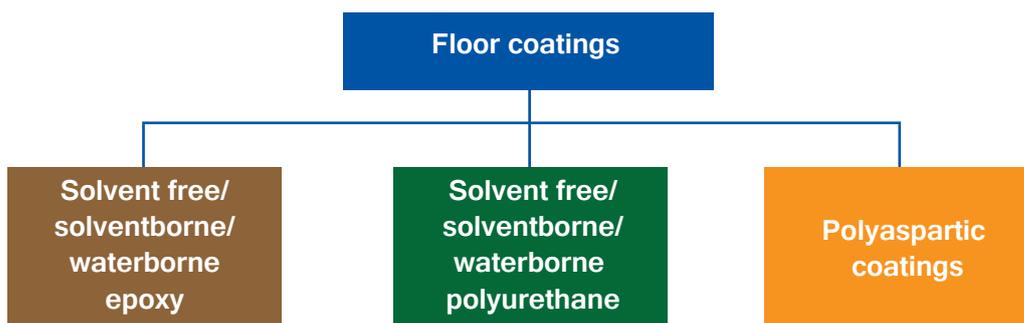


Table 1: General resin systems for floor coatings

Types of flooring	Resin systems	General applications
Solvent based epoxy 60 - 80 $\mu$ m	Solvent based Epoxy : Polyamine	Floorings
Solvent free epoxy 200 - 400 $\mu$ m	Solvent free Epoxy : Polyamine	Pipe coatings
Self leveling solvent free epoxy 0.5 - 3.0 mm	Solvent free Epoxy : Polyamine	Marine coatings
Solvent free polyurethane 1K and 2K PU 0.5 - 1.5 mm	Polyol : Polyisocyanate	Maintenance coatings
Polyaspartic 0.5 - 1.5 mm	Polyamine : Polyisocyanate	Direct to metal
		Industrial top coats
		Automotive coatings
		Heavy duty corrosion protection

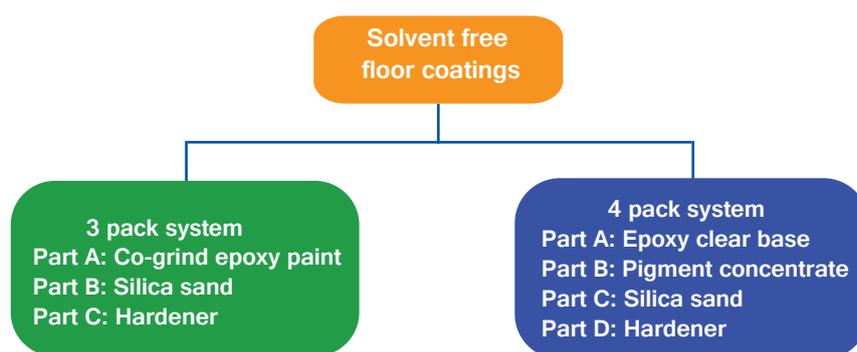
# Patcham additives for floor coatings

Table 2: Patcham additives for floor coatings

Type of coating	Additive	Grade	Dosage(%)
Co-grinding formulation (3K system)  Pigment concentrates (4K system)	Dispersing additives	<p><b>Pat-Add DA 948</b> High Molar Volume (HMV) solvent free polymer, effective in co-grind formulations, for inorganic and organic pigments and difficult to grind carbon black pigments.</p> <p><b>Pat-Add DA 815</b> Solvent free polymeric, electroneutral. Superior wetting and dispersing properties. Specially recommended for high performance solvent free pigment concentrates.</p>	<p>On SOP* (Grinding stage) White pigment : 1-5 Low structured carbon black: 30 - 50 High structured carbon black : 50 - 120 Inorganic pigments : 10-20 Organic Blue /Green : 40-60 Organic Red/Violet/Yellow : 30-70</p>
Solvent free/ Solventborne floor coating	Deaeration / Defoaming	<p><b>Pat-Add AF 70</b> Combination of polysiloxane and organic polymer. Most suitable for defoaming and deaeration in solvent free high build coatings. Applications like air assisted or airless spraying in high build coatings and self levelling floor coating. Effective for low to higher thickness (30μ-3mm) coatings. No negative impact on clarity and gloss.</p>	<p>0.5 - 1.0 (On total formulation) Grinding/Letdown</p>
Solvent free/ Solventborne floorings	Leveling	<p><b>Pat-Add LE 1066</b> Efficient surface tension modifier with an edge of deaerating property</p> <p><b>Pat-Add LE 1019</b> Solvent free polyether modified polysiloxane. Gives high surface tension reduction and best anti cratering properties.</p> <p><b>Pat-Add FL 7 / LE 1070</b> Silicone and fluoro free polymeric surface modifier. Enhances flow and leveling.</p>	<p>0.3 - 0.5 (On total formulation) Letdown stage</p> <p>0.05 - 0.2 (On total formulation) Letdown stage</p> <p>0.5 - 1.0 (On total formulation) Letdown stage</p>

\* SOP : Solid of additive on pigment

## Types of self leveling floor coating



**Three pack systems (3K)** are conventional systems of direct shades like sky blue, grey or pink. These formulations consist of co-grinding of organic, inorganic and carbon black pigments together to obtain different shades. Insufficient dispersion of pigments results in poor stability and issues like flooding, flotation and settling.

**Four pack systems (4K)** provide flexibility to develop multiple shades of floor coatings. These formulations consist of direct grinding of individual organic and inorganic pigments concentrates. Epoxy clear base is just blended with colorants, sand and hardener to get the desired floor coatings performance.

# High Molar Volume technology (HMV)

## Patcham High Molar Volume technology for formulating solvent free coatings

Pat-Add DA 948 is based on "High Molar Volume technology" for developing solvent free coatings. Patcham's innovative High Molar Volume technology is based on a polymer design with a higher volume per mass as compared to conventional high molecular weight dispersing agents. Higher volume would result in a thicker adsorbed layer around the pigments, that can lead to increased resistance to attractive forces i.e., less flocculation and hence lead to more stable pigment dispersions.

Multiple anchoring groups and multi compatible polymeric chains make it most suitable for different types of pigments from high structured carbon blacks, to organic pigments in a range of resin systems.

### Key features of High Molar Volume technology:

- ▶ Dense network of anchoring groups provide best wetting of pigments
- ▶ Contributes to optimum mill base viscosity and reduced milling time
- ▶ Higher jetness and bluer undertone in carbon black dispersions
- ▶ Provides excellent long term stability of pigment dispersions
- ▶ Superior gloss and transparency in organic pigment dispersion

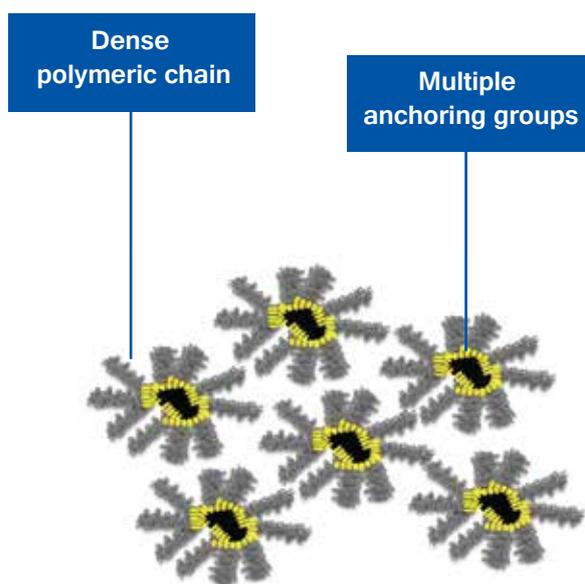


Figure 1: Generic illustration of HMV polymer

# Defoamer for floor coatings

## Pat-Add AF 70 - Balanced defoaming and compatibility



Figure 2: Defoaming and compatibility test

From the above test one can see that Pat-Add AF 70 gives a transparent, glossy film along with its defoaming and deairing properties as compared to the reference (Right side of Figure 2). This shows that Pat-Add AF 70 has best balance between defoaming, deaeration and compatibility with the resin system.

## Pat-Add AF 70 - One defoamer for various applications



Roller coating or self levelling application

Gravity feed, suction feed air assisted or Airless spray application

Figure 3: Pat-Add AF 70 eliminates foaming issues during paint mixing and various types of applications

Pat-Add AF 70 is a unique combination of polymer and silicone in a solvent which makes it multi functional and it can be used for any kind of application like roller, self leveling or spraying. It destroys both micro and macro foams generated at all stages, like paint manufacturing, mixing on site application and final curing.

# Solvent free self leveling epoxy co-grinding system

## Guide formulations for 3 pack systems - Co-grinding

Table 3: Epoxy grey and blue top coat formulations

Sl.No	Raw materials	Epoxy grey	Epoxy blue	Procedure
<b>Mill base</b>				
1	Epoxy resin (100% solids)	30.00	30.00	Mix RM 1, 2 and 3 until homogenous at 1000 rpm.
2	Reactive diluent	4.00	4.00	
3	Pat-Add DA 948/Reference	0.20	0.20	
4	Titanium dioxide	10.00	10.00	Slowly add pigments and continue premix for 10 mins at 2000 rpm
5	Carbon black	0.10	0.00	Add glass beads and mill the sample until <15µm.
6	Organic blue	0.00	0.50	
<b>Letdown</b>				
7	Epoxy resin (100% Solids)	47.00	46.60	Add RM 7 for stabilization. Mix for 2 mins at 2000 rpm. Filter mill base.
8	Reactive diluent	8.00	8.00	
9	Pat-Add AF 70/Reference	0.20	0.20	Add the remaining RM's in the mill base and mix for 10 mins at 1500 rpm.
10	Pat-Add LE 1066/Reference	0.50	0.50	
	<b>Total</b>	<b>100.00</b>	<b>100.00</b>	

Table 4: Physical parameters of epoxy grey and blue top coat

Raw materials	Epoxy grey		Epoxy blue	
	Pat-Add DA 948	Reference	Pat-Add DA 948	Reference
<b>Wet properties</b>				
Viscosity premix (cP)	814	849	886	915
Viscosity after grinding (cP)	929	859	878	959
Viscosity of paint (cP)	806	798	779	849
Gloss @ 20°	80	75	89	83

# Solvent free self leveling epoxy co-grinding system

Mixing ratio	
Part A - Base paint	48.00
Part B - Hardener	20.00
Part C - Silica sand	32.00

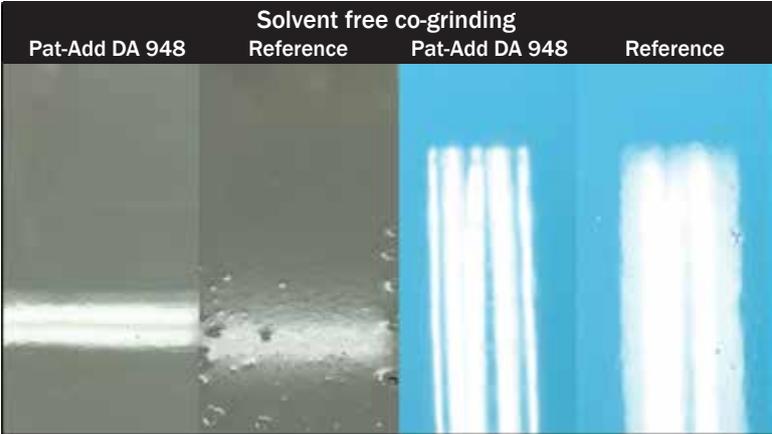


Figure 4: Film appearance of self leveling epoxy grey floor coatings (3 pack)

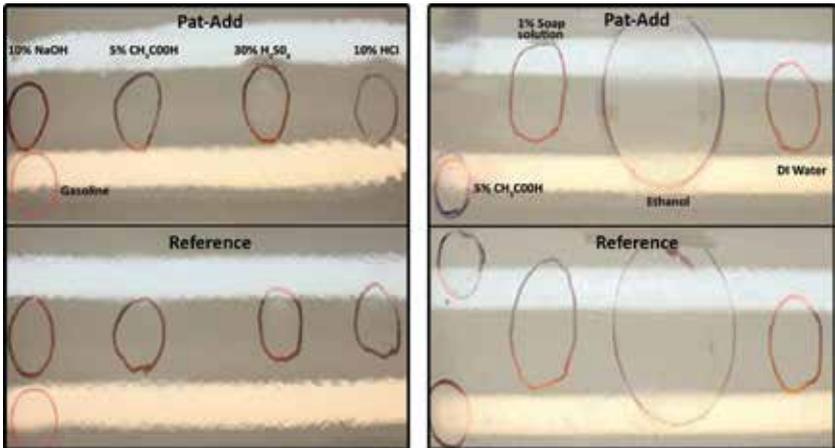


Figure 5: Chemical resistance test for epoxy floor coatings

# Solvent free self leveling epoxy four pack (4K) system

## Guide formulations for solvent free epoxy colorants

Table 5: Solvent free resin minimal pigment concentrates

Raw materials	TiO <sub>2</sub> PW 6	Special black <sup>®</sup> 4 P Blk 7	Red iron oxide PR 101	Yellow iron oxide PY 42	Chrome oxide green PG 17	Hostaperm <sup>®</sup> pink PR 122
<b>Mill base</b>						
Epoxy resin (100%)	17.50	30.00	15.00	15.00	15.00	34.00
Reactive diluent	20.00	36.00	18.30	19.50	16.50	28.00
<b>Pat-Add DA 815</b>	0.50	5.00	6.00	5.00	5.50	5.00
Pigment	60.00	15.00	50.00	50.00	55.00	16.00
Fumed silica	0.30	0.00	0.40	0.40	0.40	0.00
<b>Letdown</b>						
Epoxy resin (100%)	1.70	14.00	10.30	10.10	7.60	17.00
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.0</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
SOP of dispersant (%)	0.80	33	12	10	10	31

Table 6 : Solvent free self leveling epoxy grey high thickness floor coatings

Raw materials	Weight (%)
<b>Part A (Epoxy clear)</b>	
Epoxy resin 100%	15.35
Epoxy diluents	2.95
Pat-Add AF 70	0.10
Pat-Add LE 1066	0.06
Pat-Add LE 1019	0.04
<b>Part B (Hardner)</b>	
Polyamine hardener	9.00
<b>Part C (Pigment paste)</b>	
Epoxy pigment concentrate	2.50
<b>Part D (Silica sand)</b>	
Silica sand	70.00
<b>Total</b>	<b>100.00</b>



Figure 6: Film appearance of solvent free self leveling epoxy grey high thickness floor coating

# Solvent free self leveling epoxy four pack (4K) system

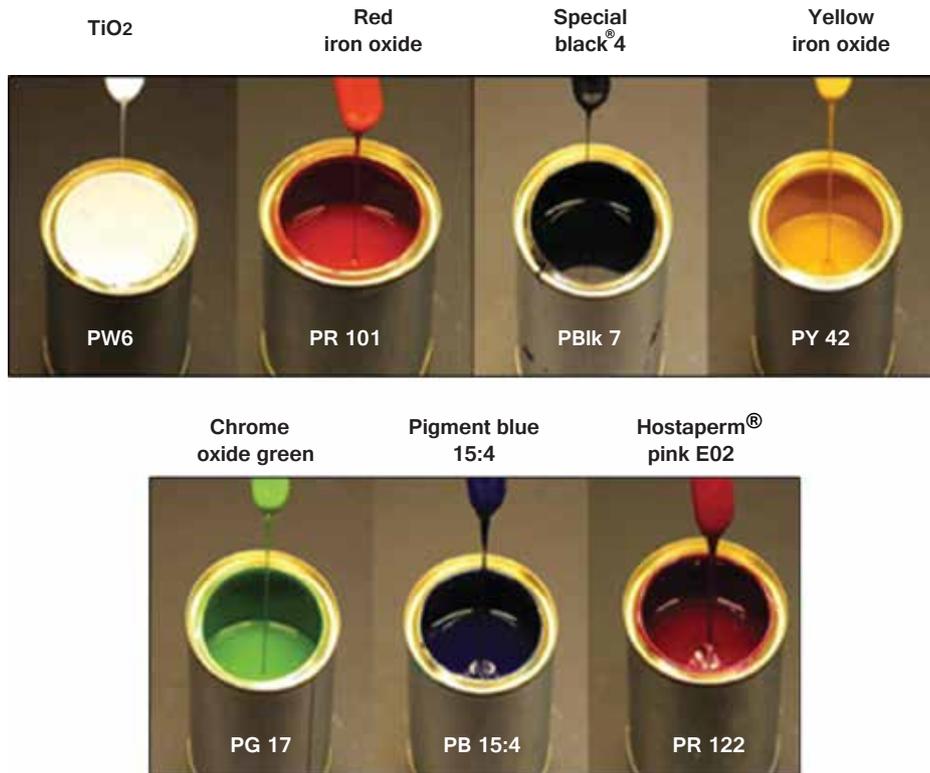


Figure 7: Flow behavior of solvent free resin minimal pigment concentrates after 3 months stability at room temperature

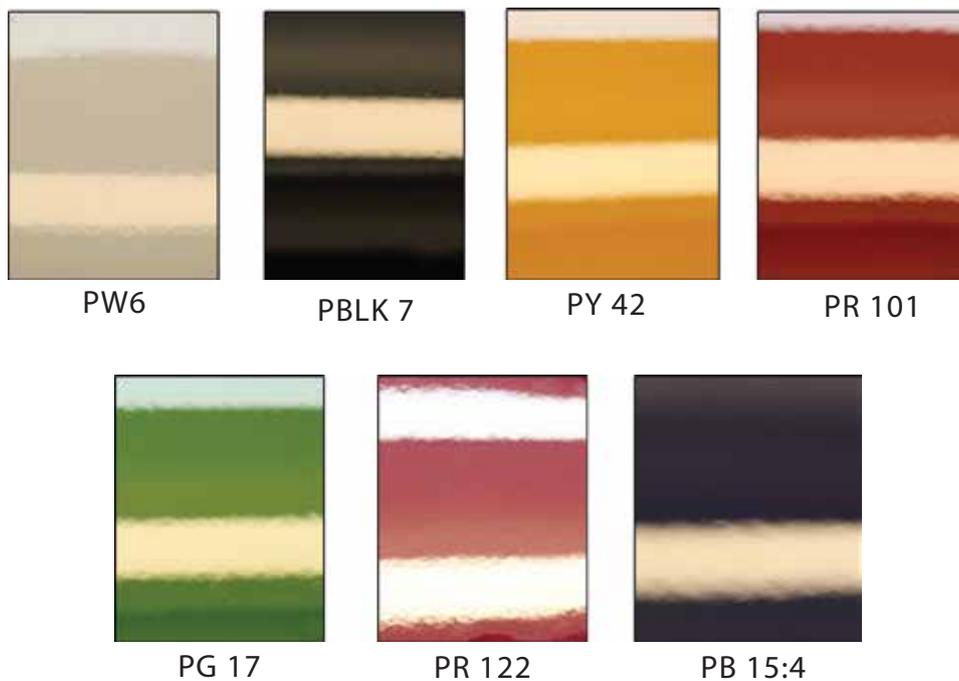


Figure 8: Film appearance of self leveling epoxy floor coatings (4 pack)

# Polyurethane floor coating

## Solvent free polyurethane floor coatings

Table 7: Formulation of 2K PU solvent free floor coating

Raw Materials	Weight (%)
<b>Part A</b>	
Modified solvent free polyol	23.0
<b>Pat-Add DA 948</b>	0.2
Moisture scavengers	5.0
Barytes	42.0
Titanium dioxide	5.0
Chrome oxide green	1.5
Modified solvent free polyol	23.0
Blank / <b>Pat-Add AF 70</b> / Reference	0.3
<b>Total</b>	<b>100.0</b>
<b>Part B</b>	
Aromatic polyisocyanate based on diphenylmethane diisocyanate	10.0

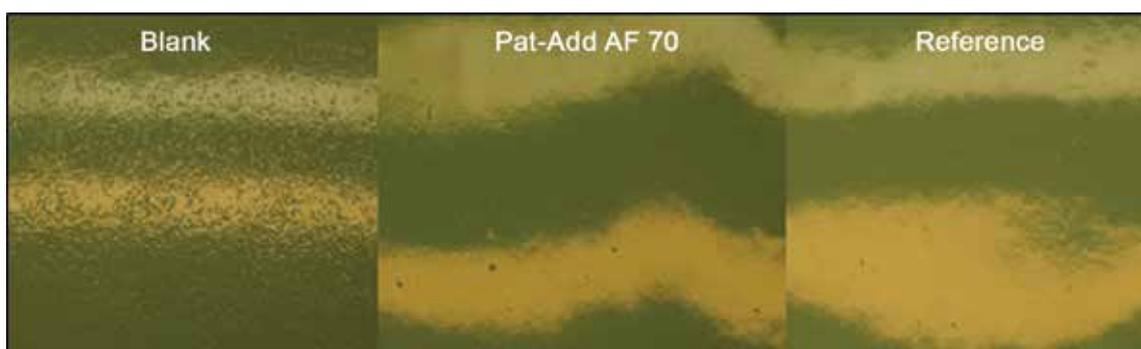


Figure 9: Performance of Patcham additives in PU floor coatings

Table 8: Film properties of 2K PU floor coating

Properties	Blank	Pat-Add	Reference
Gloss @ 20°	67	92	80
Gloss @ 60°	91	96	97
Surface appearance	Micro foams and pinholes	No foam	No foam

# Polyaspartic floor coating

Table 9: Formulation of polyaspartic floor coating

Raw materials	Weight (%)
<b>Polyaspartic clear</b>	
Amine functional resin 1	25.50
Amine functional resin 2	57.30
Amine functional co-reactant	16.50
<b>Pat-Add AF 70</b>	0.20
<b>Pat-Add LE 1019</b>	0.10
<b>Pat-Add LE 1070</b>	0.40
<b>Total</b>	<b>100.00</b>
<b>Part A</b>	
Polyaspartic clear	80.00
Resin minimal pigment concentrate	20.00
<b>Total</b>	<b>100.00</b>
<b>Part B</b>	
Aliphatic polyisocyanate	62.00

Table 10: Gloss value of polyaspartic floor coating

	White	Black	PY 74	PB 15:3
Gloss @ 20°	89	86	86	86
Gloss @ 60°	94	92	92	91

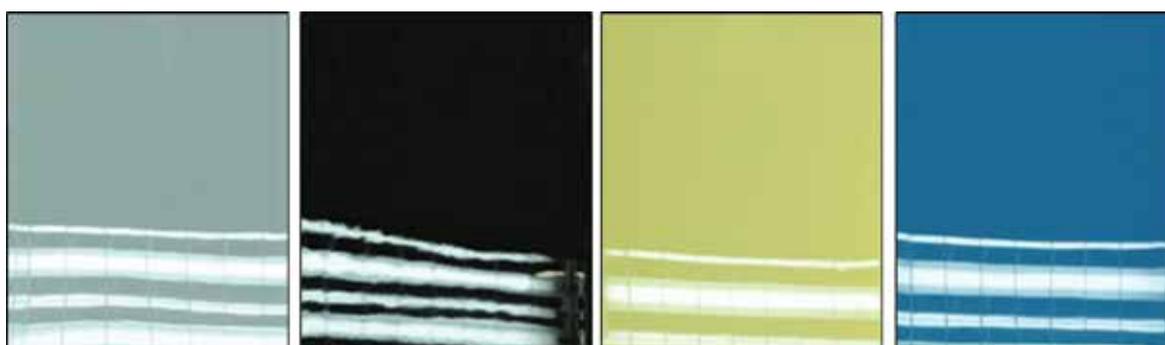


Figure 10: Flow and leveling of polyaspartic floor coating

# Notes

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