

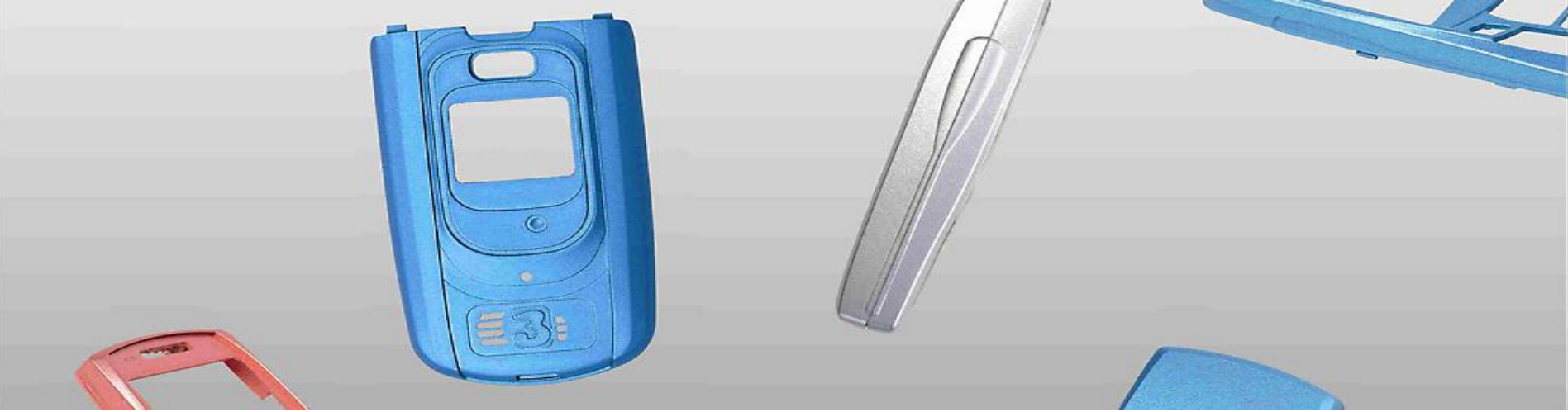


Science For A Better Life

WB UV: The Green & Efficient Coating Solution

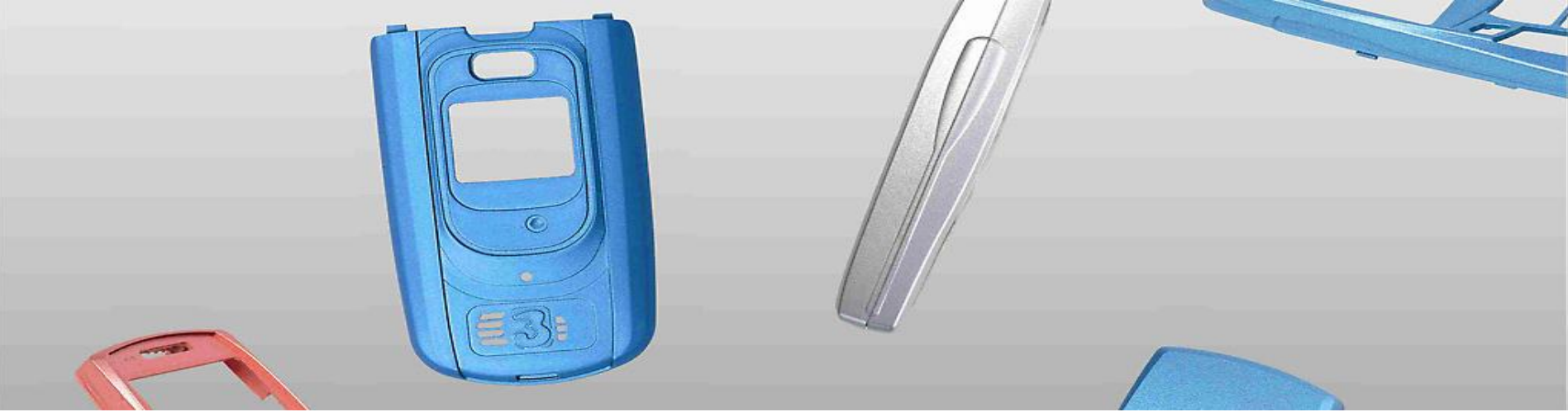
水性UV: 绿色高效的涂料解决方案

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Business Development CAS APAC
Sep. 2012



Agenda 内容

- Brief Introduction on WB UV 水性UV技术简介
- WB UV Products 水性UV产品
- WB UV for Plastic Coatings 水性UV用于塑料涂料
- WB UV for Wood Coating 水性UV用于木器涂料
- Summary 小结



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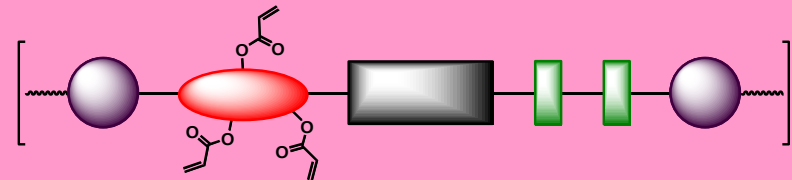
BMS Solution for Low VOC Spray Coatings

拜耳材料科技提供低VOC涂料解决方案



UV Curing PU Dispersions

水性光固化聚氨酯



Waterborne UV Polyurethane Dispersion (WB UV PUD) 水性聚氨酯分散体



WB UV PUD

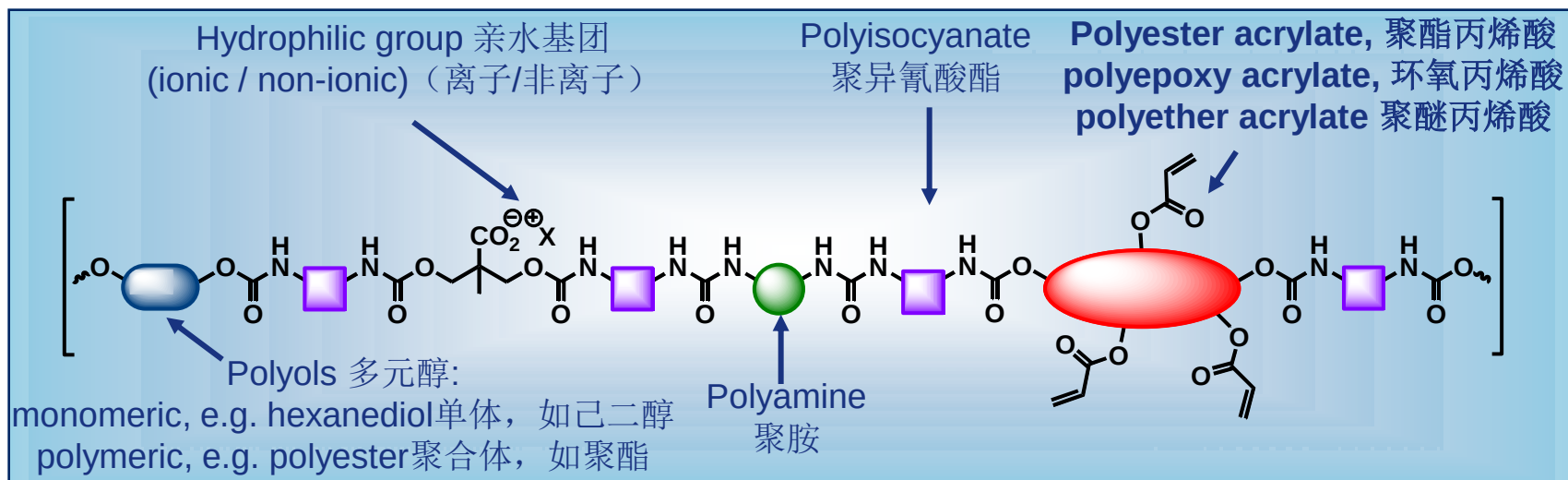
- Semi-transparent/milky 半透明至牛奶状
- 30-50% solid content 固含30%-50%
- Polyurethane polymer 聚氨酯大分子
- Without any solvent 不含任何溶剂

Performance

- ✓ Fast drying possible 快干
- ✓ high mechanical/chemical resistance 良好的机械和耐化
- ✓ outstanding hardness-flexibility balance 软硬平衡
- ✓ highest flexibility possible (soft feel) 高柔韧性（柔感）
- ✓ Wide / broad compatibility 良好的兼容性

UV Waterborne Technology 水性光固化技术

Unsaturated PU dispersion based on polymeric acrylate *



- Highly reactive 高反应性
- No reactive thinners (monomers) necessary 不再需要活性稀释剂或单体
- High molecular weight 高分子量
- Co-solvent-free 不含任何溶剂

* EP-B 0753531

UV Waterborne Technology 水性光固化技术

Production: Acetone process 丙酮法合成技术



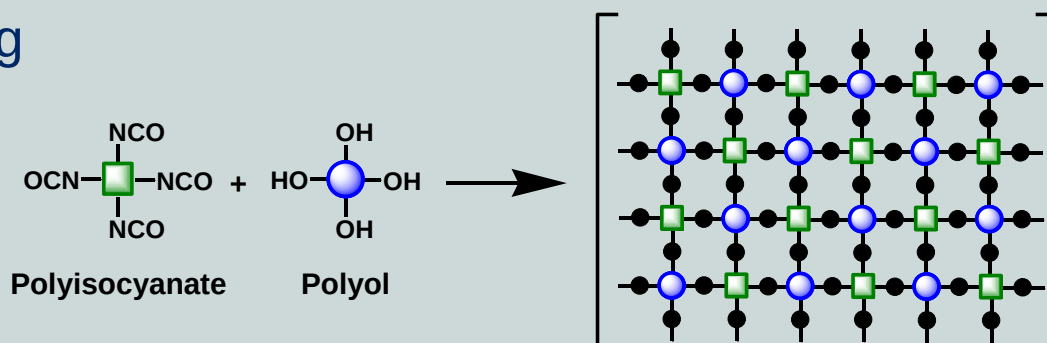
Bayer MaterialScience production process for high molecular weight PU dispersions

- /// High molecular weight 高分子量
- /// No need for UV monomers 无单体
- /// No need for co-solvents 无溶剂

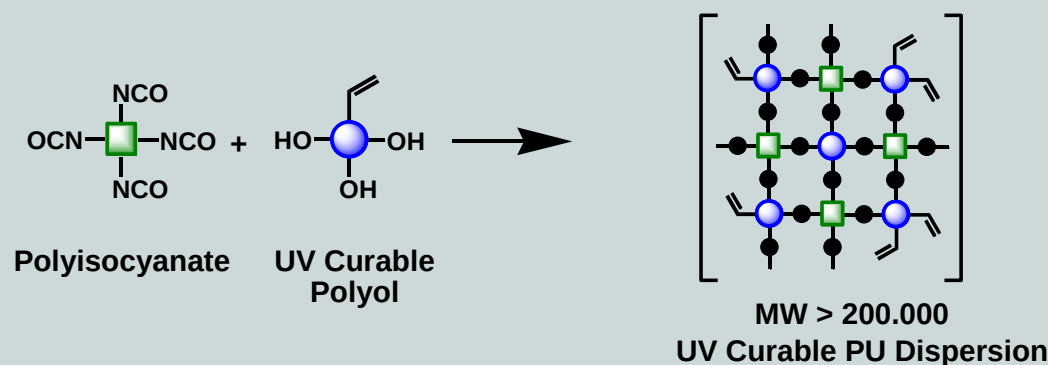


UV Waterborne Technology 水性光固化技术

2K-PU coating



UV curable PU dispersion



UV-curing equipment 光固化设备



WB UV PUD -Curing Steps 固化过程



WB UV PUD(Double bonds)

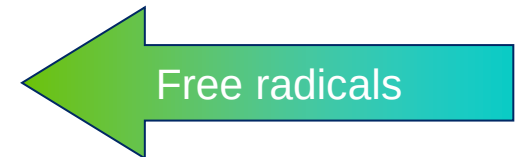
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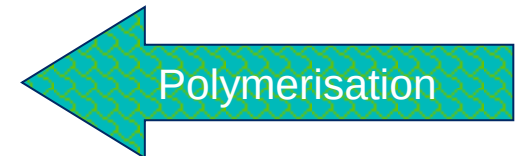
Photoinitiator



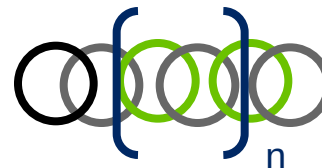
UV-light activates the photoinitiator, which cleaves and generates free radicals.



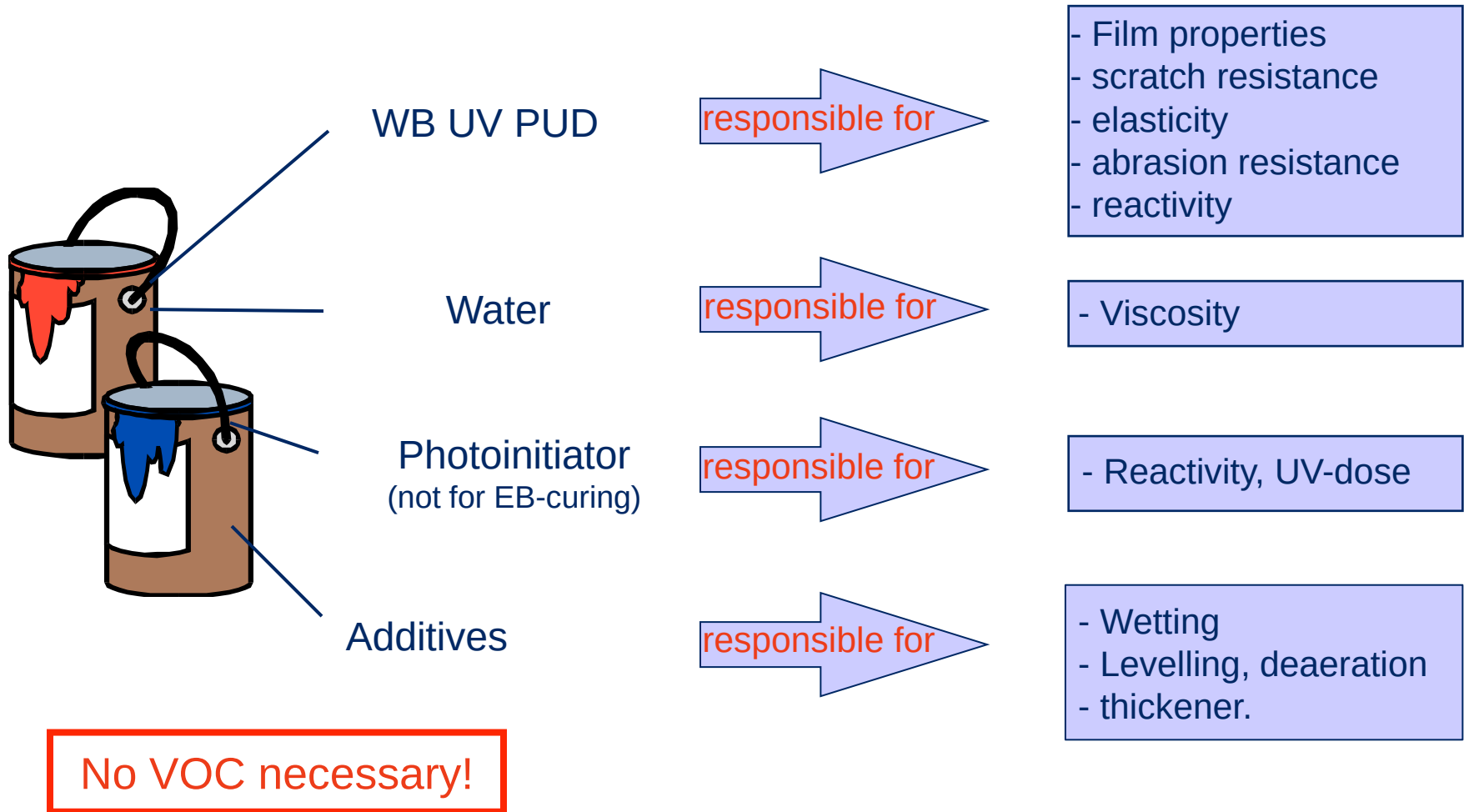
Radical attacks a double bond, a new bond is formed and on the other end of the attacked double bond there is a new radical.



Long chains are formed. If there is more than one double bond per molecule present crosslinking will occur. A three-dimensional network is formed.



WB UV PUD - Coatings Formulation 配方



Coating Formulation: 配方对比

100% or Solventborne UV vs. Waterborne UV



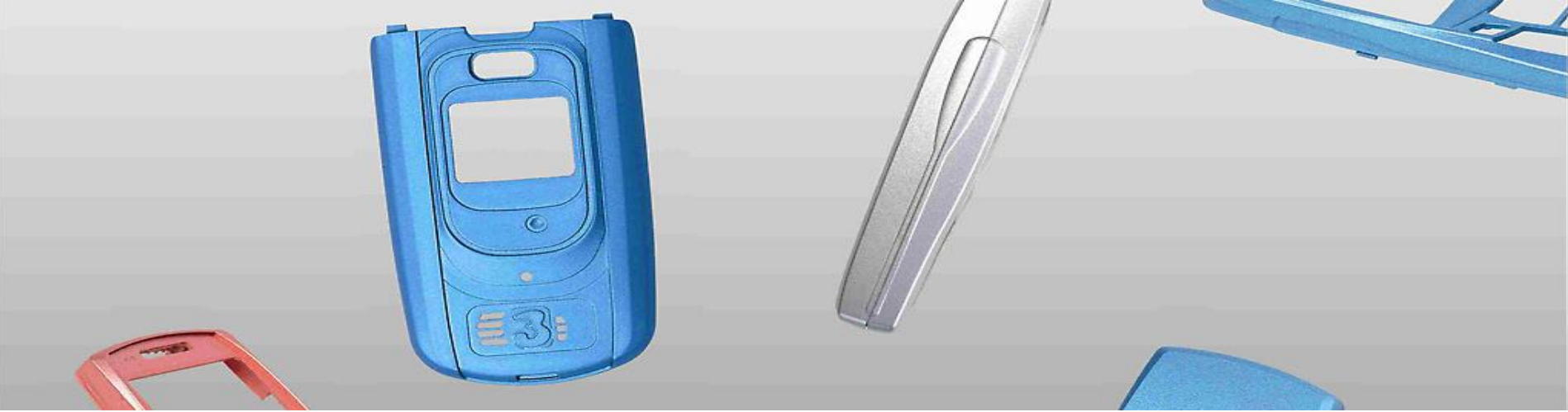
100% or solventborne UV formulation

- Oligomer(s)
 - functionality
 - medium molecular weight
 - high shrinkage
- Monomer(s)
 - high crosslink density
 - viscosity cutting
 - swelling of substrate (adhesion)
- Photoinitiator(s)
- Additives
- (Organic Solvent)



Waterborne UV formulation

- UV-curable resin
 - high molecular weight
 - low shrinkage
- (Optionally monomers)
- Photoinitiator(s)
- Additives
- (Optionally organic co-solvents)
- Water



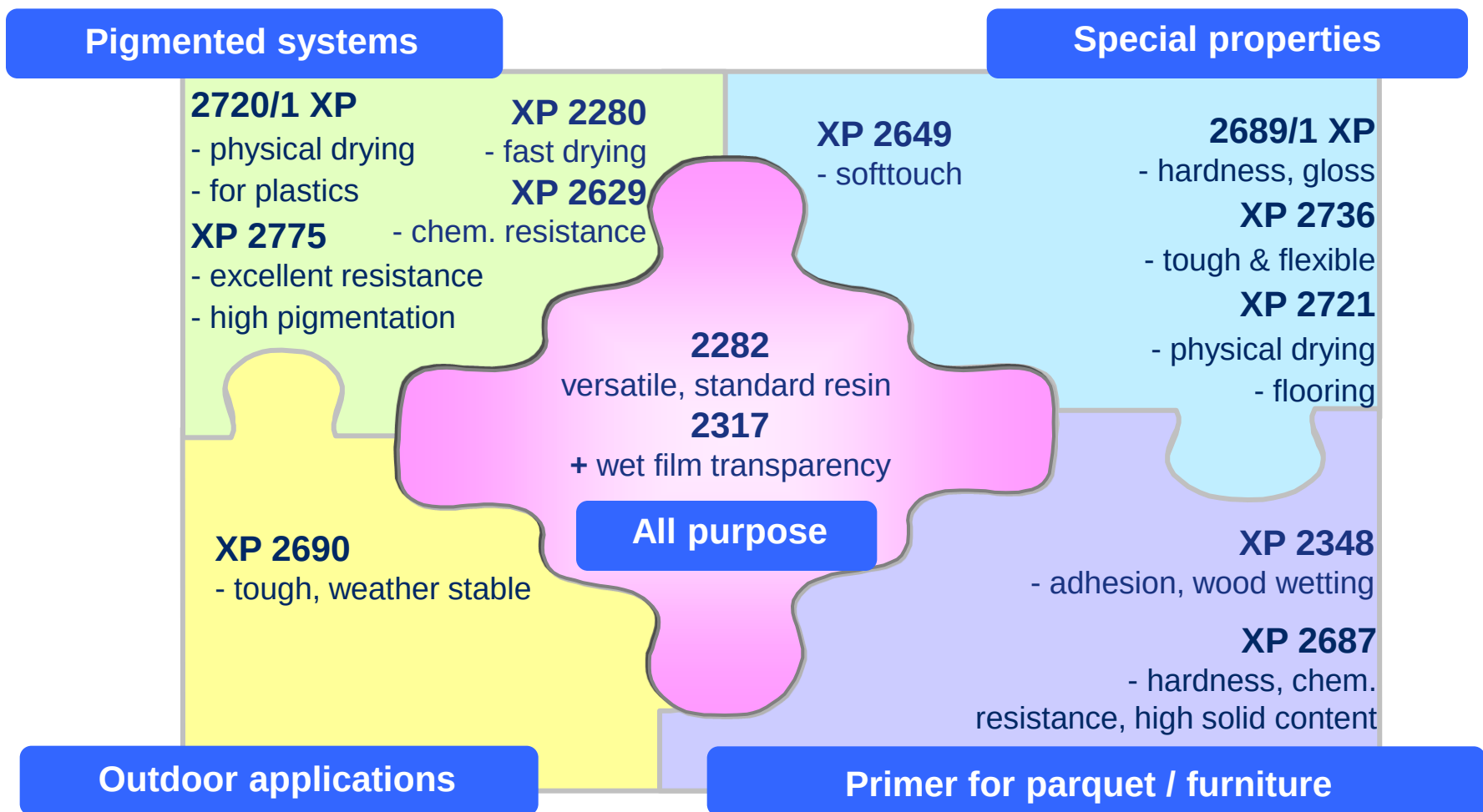
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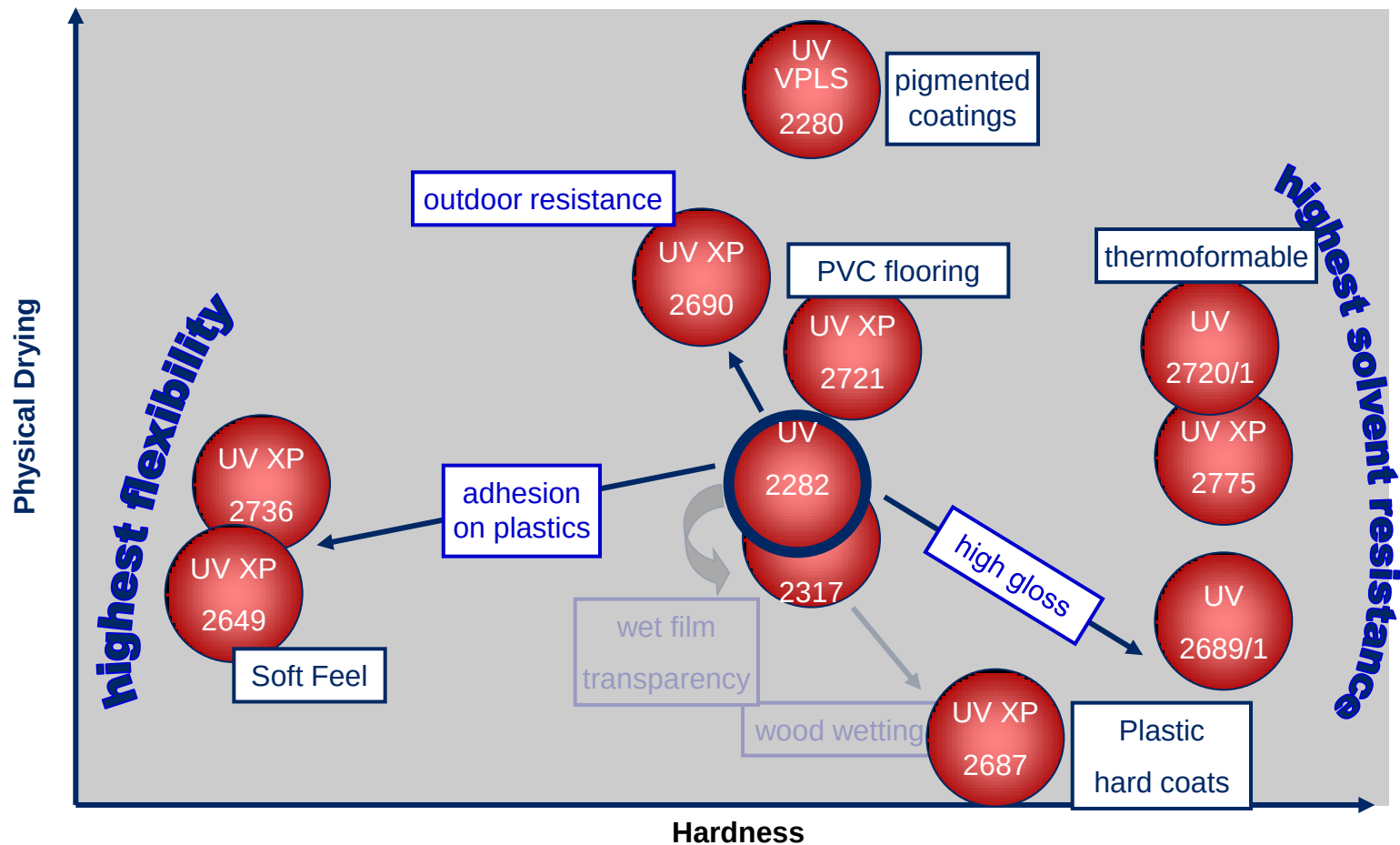
Bayhydrol UV® Toolbox 水性UV 产品

Product range of UV curing PU dispersions





BAYHYDROL[®] UV: UV Curing PU Dispersions for Plastic Coatings

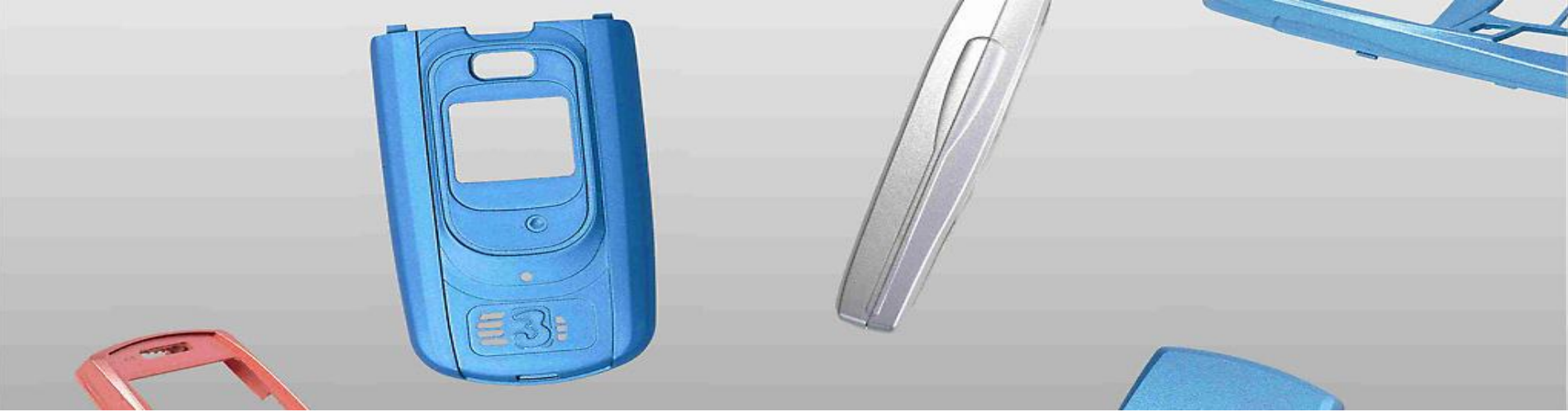


Bayhydrol® UV resins for Plastic Applications

塑料用水性UV树脂



Bayhydrol UV ®	Properties
Bayhydrol UV XP 2649	• soft touch 柔感
Bayhydrol UV 2689/1 XP	• high hardness 高硬度 • high chemical and RCA abrasion resistance 高耐化抗刮性能 • high gloss 高光
Bayhydrol UV XP 2687	• Excellent appearance, high gloss & high film build 出色的外观丰满 • Good chemical and mechanical resistance 耐化，机械性能
Bayhydrol UV 2720/1 XP	• physical drying, thermo forming before UV 光固化前可表干 加工 • high molecular weight 高分子量
Bayhydrol UV XP 2721	• physical drying, embossing before UV 光固化前可压花
Bayhydrol UV XP 2690	• Tough 硬韧 • Outdoor application 适合户外使用 • Fast water evaporation 水挥发快



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UV Curing PU Dispersions

WB UV Products available for:

- Hard Coat 硬涂层
- Soft Touch 柔感
- FIM Process 用于FIM工艺
- PVC Flooring PVC地板
- Temporary Functional Coating
暂时功能涂料

Waterborne UV Hard Coat 硬涂层

Bayhydrol UV XP 2687, 2689/1XP

Properties hard clear coat :

- high gloss (>90 at 20°) 高光
- Pencil hardness H or higher 高铅笔硬度
- Excellent adhesion in crosshatch/tape test also after immersion in boiling water
- Resistance against prolonged influence of high temperature and high humidity
- Chemical resistance against solvents but also against suntan lotion at elevated temperature and high humidity, cosmetics and fluids that simulate human sweat
- High abrasion resistance in RCA, Taber and Nokia vibrational wear test
- Resistance to hot-cold-cycles



It has been especially developed for mobile phone applications. Optimized formulations are available for **hard clear coat**, **easy wipe-off** and **single layer metallic**.

Waterborne UV Soft Touch 柔感

Bayhydrol UV XP 2649*



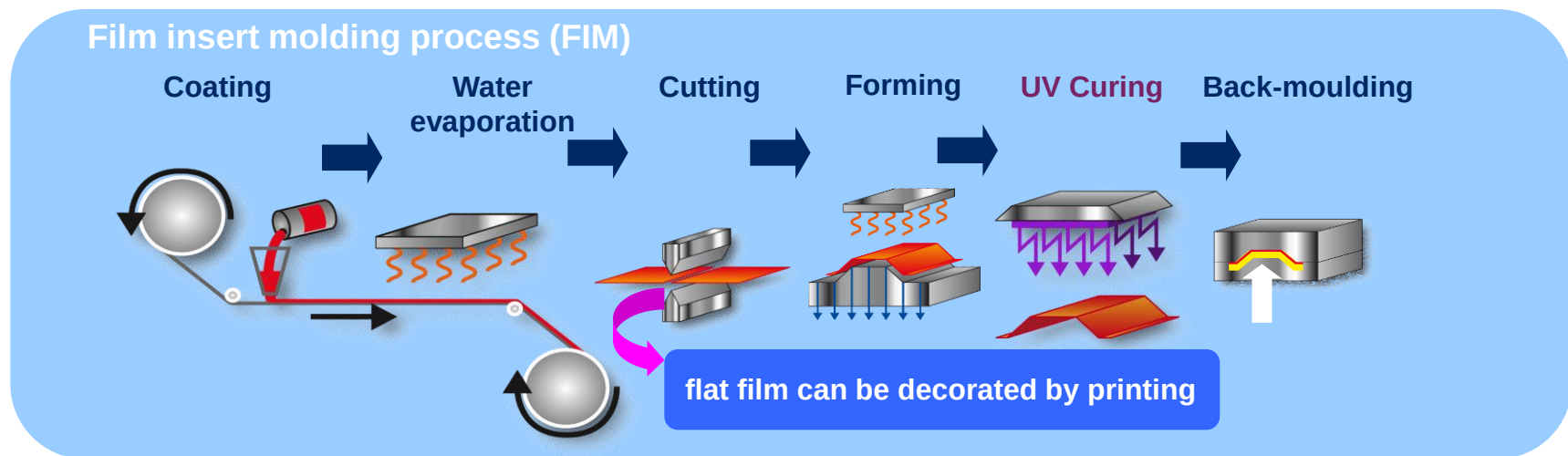
- UV curable PU Dispersion for soft-touch coatings is commercially available
- Target markets are industrial coatings (plastics, wood, printing, ...)
- Performance level is similar to standard 2K waterborne PU systems
- Increased productivity in painting operation
= lower total cost

*new version products
is under developing



Thermoformable Pre-coated Films 热变形预涂

Bayhydrol UV XP 2721, XP 2690, 2720/1XP



- Bayer MaterialScience has unique UV PUDs available suitable for FIM & other film applications 水性光固化用于薄膜工艺
- Two step drying process: 两步干燥过程
 - **Step 1:** water evaporation/ physical drying 水挥发后即表干
Post formable but blocking resistant film is acquired after the first drying step
 - **Step 2:** UV curing UV照射固化
Hard coat with the final properties is obtained after UV curing

Challenge & Solutions to Get Hard Coats in FIM

FIM工艺中硬涂层的挑战与方案



Thermoforming of fully cured films 完全固化的涂层进行热变形

- Fully cured soft coatings are thermoformable but do not meet e.g. hardness, chemical resistance, scratch resistance requirements
完全固化的软涂层很容易进行热加工变形，但却无法满足硬度，耐化抗刮的性能要求
- Fully cured hard coatings will crack when thermoforming process is conducted
完全固化的硬涂层，性能上能达到要求，但是加工处理过程中则容易开裂

How to obtain a hard coat where a thermoforming step is part of the process?

- **A two step curing process is required.** 需要两步干燥

Bayer MaterialScience offers:拜耳可提供的解决方案

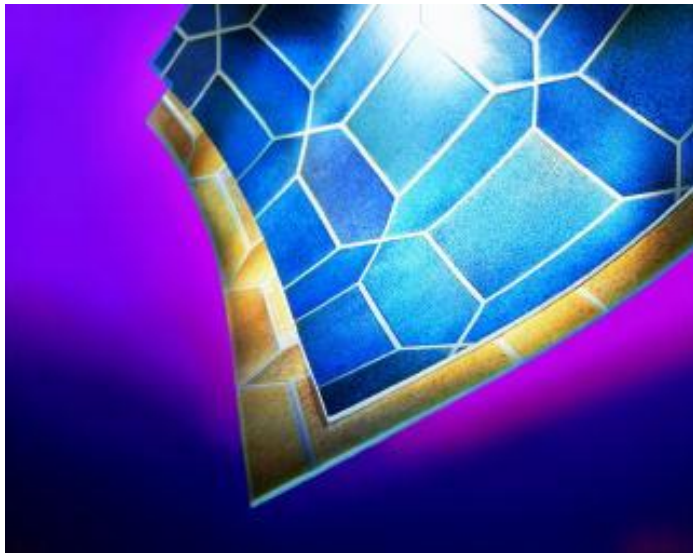
- **Waterborne UV system** 水性光固化体系

Waterborne UV For PVC Flooring PVC地板

Bayhydrol UV XP 2720/1, XP 2721, XP 2690



- Embossing possible before UV 光固化前可压花
- Barrier properties; meets European indoor quality standards 阻隔效应
- In Europe WB systems are quickly replacing solvent based systems; 40-50% WB, mainly waterborne UV 欧洲水性占到40-50%，而且主要是水性UV



Temporary Functional Coatings

暂时功能涂料

- A temporary functional coating is a peelable coating used as temporary protection for high-end products against chemical and mechanical damage, dust, fingerprint or stain.
- Could be applied on different substrates e.g. plastic, glass, metal, coated parts
- Application areas are e.g. IT & Electronics, automotive, construction and furniture

Characteristics

1 Component / UV



High efficiency

Spray possible



Suitable for 3D

Polyurethane



Thermo-stable
Tough & elastic

Waterborne / UV curing



Eco-friendly

No adhesive



No trace/ residue



Complete Waterborne Solutions for Plastic 为塑料涂料提供全部水性解决方案



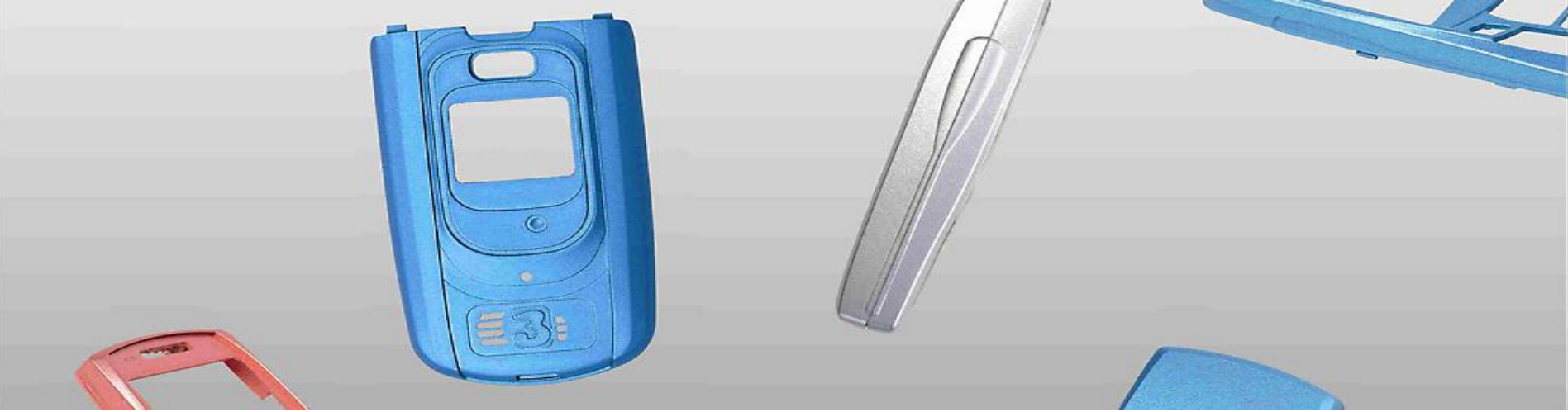
Waterborne UV

- Top coat
 - Hard clear, deep matt, soft touch
- Easy wipe-off
- Mono coat
 - Clear, pigmented, metallic
- Thermo formable pre-coated films
- Temporary functional coating

Waterborne PU

- Primer
- Base coat
- Top coat
 - hard coat, soft touch, self healing
- Mono coat
 - solid color, metallic
- Temporary functional coating
- Coating for difficult substrate
 - PC + glass fiber, PA + glass fiber,...





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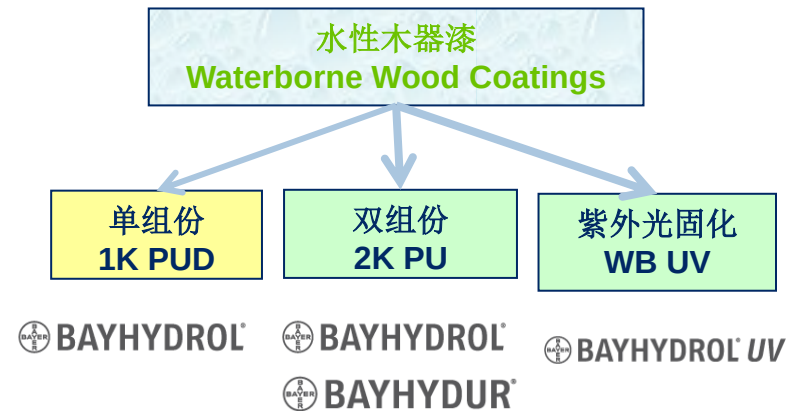
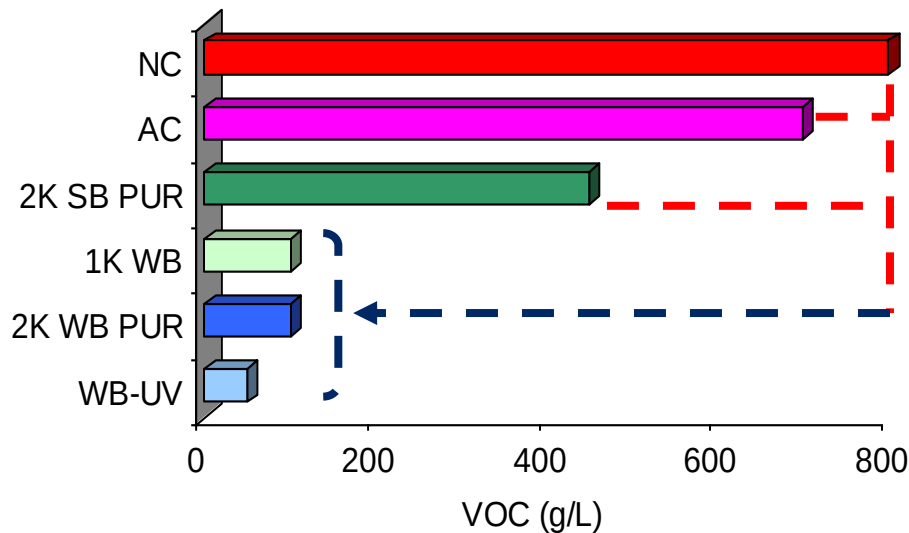
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Global Trend: Reduction of VOC Emissions

全球趋势：减少VOC排放



区域	法规	生效日	目标	目标企业
欧洲	溶剂排放指令 1999/13/EC 家装指令 2004/42/EC	2007-1-1	VOC减少 60-70% (2010年与1990年相比)	涂料油墨和胶粘剂企业 (包括手工作坊和工业企业)
中国大陆	修改国标 GB18581-2009 增加对VOC的限制	2010-6-1	继续减少VOC排放	内墙涂料和家装木器涂料



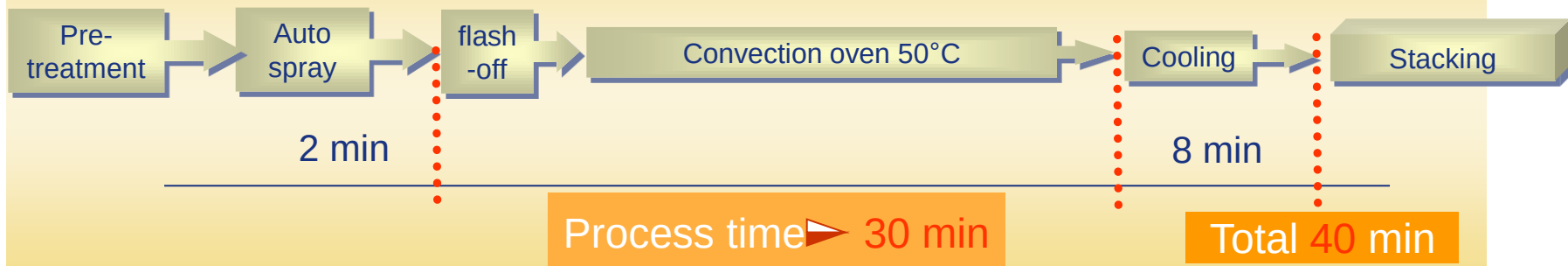
Productivity for WB UV Wood Application

水性UV木器涂料生产效率

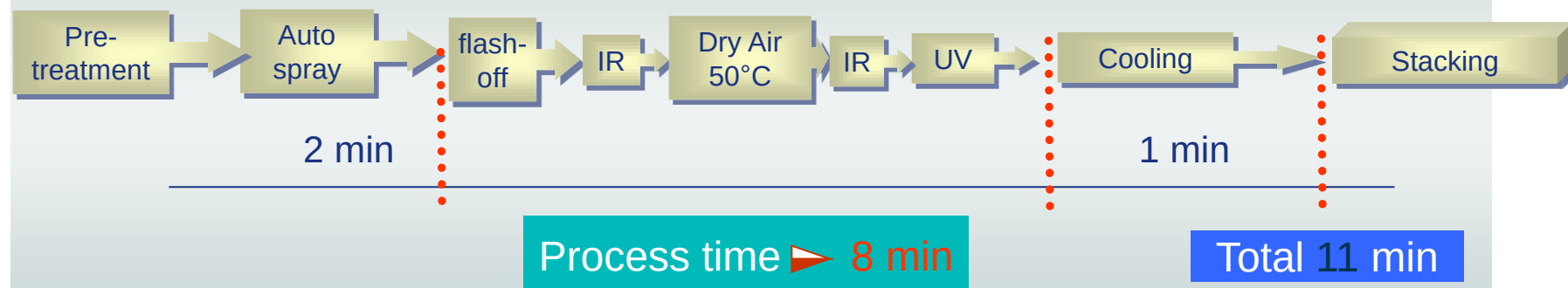


Example: Clear Coat 清漆(80 – 100 g/m² wet湿膜)

Conventional line with solventborne, chemical drying coatings (2K-PU)



Waterborne UV with optimized dryer



水性UV木器家具涂料产品应用 WB UV for Wood & Furniture



BAYHYDROL UV



Clear furniture coatings

1



Pigmented coatings

2



Wood/parquet primers

3



Outdoor coatings

4

木器家具涂料核心产品

Wood & Furniture: Key Products



Product code 产品代号	Application area 应用领域	Properties性能
Bayhydrol UV 2282 (PUD)	All round use 各种用途	- Fast water release 水分挥发快 - Physical drying 物理干燥 - Good wood warmth 木纹显影性好
Bayhydrol UV 2317 (PUD)	All round use 各种用途	- Excellent wet film transparency 湿膜透明 - Good adhesion 附着力好 - Physical drying 物理干燥
Bayhydrol UV XP 2280 (PUD)	Pigmented top coat 色漆面漆	- Very fast water release 水分挥发非常快 - High hardness 高硬度 - Good chemical and stain resistance 耐化学品和 耐污性好
Bayhydrol UV XP 2687 (PUD)	Clear or stain primer for parquet, clear top coat for furniture 地板底漆 或家具面漆	- High solid (50%), good re-emulsification 高固含，可在乳化 - Good adhesion for parquet 附着力好 - High gloss & high film build up 高光泽，高丰满度
Bayhydrol UV XP 2775 (PUD)	Clear or pigmented top coat for furniture 清漆或色漆面漆	- High gloss & high hardness 高光泽,高硬度 - Excellent chemical and stain resistance 优异的耐化学品和耐污性 - High film build up 高丰满度
Bayhydrol UV XP 2690 (PUD)	Clear or pigmented top coat for furniture 清漆或色漆面漆	- Fast water release 水分挥发快 - Excellent balance of hardness and elasticity 硬度和柔韧性平衡好 - High resistance 高耐性

UV-Curing from industrial to on-site application

紫外固化从工业到现场施工



当前主流技术：工业UV

State of the art: Industrial UV

- 节能高效
Energy saving and high productivity
- 单组份，低VOC
1K, low VOC
- 优异性能
Excellent property profile

新应用：现场施工

New application: On-site

- 延续紫外技术优势
Make use of UV advantages
- 缩短施工时间，保证高质量要求
Reduce downtime @ high quality

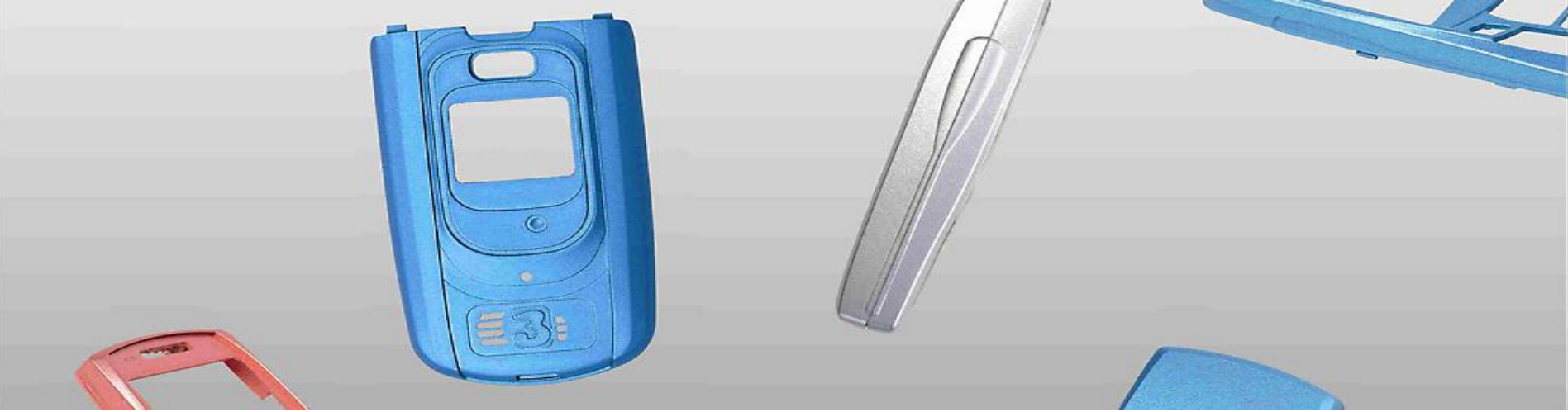


Industrial



On-site





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Summary 小结

- Nowadays the developments of low VOC coatings is more and more important.
如今，低**VOC**环保涂料体系的开发越来越重要
- As the combination of waterborne coating and UV curing technology, waterborne UV coating is regarded as the greenest and efficient solution.
水性光固化涂料结合了水性和光固化的优点成为最环保并且高效的涂料解决方案
- Bayer MaterialScience provides eco-friendly coating solutions: WB PU & UV
拜耳材料科技可提供的环保涂料解决方案：水性聚氨酯和水性光固化
 - Products available for 3C and other plastics, including hard coat, soft touch, WB UV products especially designed for UV curable thermoformable pre-coated films, for example film insert moulding (FIM)
产品可应用于**3C**和其他塑料，包括硬涂层，柔感等，水性**UV**尤其适用于薄膜领域，例如 **FIM**工艺
 - Products available for wood and furniture application. And WB UV from industry and on-site application.
产品可用于木器和家具涂装，且水性**UV**可实现从工业化生产到现场施工



Science For A Better Life

Thank you!

for further questions:

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