近零 VOC 下提供高耐污渍性能的第三代 Acronal® ECO

The 3rd Generation of Acronal® ECO for High Stain Resistance at near Zero VOC

作为巴斯夫在优质内墙水性涂料方面的最新创新，Arconal® ECO 7653 是一种用于近零 VOC 涂料、具有优良成膜性能的先进聚合物分散体。其聚合物组分和多相形态的精确平衡使得到的涂膜能够更好地抵抗污染物的渗透。

Dr. Joshua Taylor *, Dr. Leo Fan, Dr. Rachel Sun, Zhiqun Ye, Cyfer Chen, Dr. Juan Zhou, Dr. Satish Gaonkar
* PT BASF Indonesia 巴斯夫，印尼
joshua.robert.taylor@basf.com

通过与 BASF 的其它高效且低 VOC 的添加剂进行适当的搭配，即使在高于典型的市场标杆的颜料体积浓度（PVC）下，也观察到优良的 GB 耐污渍性。随着 TVOC 水平和气味的显著降低，使用 Acronal ECO 7653 配制的涂料时，消费者将得到更好的健康和新鲜空气的体验。

内墙涂料 Acronal ECO 7653 分散物的设计

中国的装饰性水性内墙涂料市场呈现多元化和逐步发展。使用方便和物有所值一直是几乎所有消费者一开始就考虑的主要因素。过去，消费者愿意在家中、工作场所和公共空间忍受有气味的涂料的施工和干燥。不过，大约从 15 年前开始，随着人们对接触有害物质方面的健康意识的增长，态度开始发生变化。重涂板块的增长进一步强调新涂料应具有更少的有害的和产生气味的化学品。与此同时，配方师自然寻求额外的涂料性能来吸引市场。作为涂料行业的重要供应商，BASF 认识到这两种情况，并专注了开发了一类新产品，该聚合物分散体具有明显较低的气味并具有更好的耐污渍性。推出的第一代产品是 Acronal ECO。我们很高兴在本文中介绍第三代 ECO 产品，Acronal ECO 7653。

Acronal ECO 7653 是一种用于近零 VOC 优质内墙涂料的丙烯酸低气味聚合物分散体。它不含 APEO 和氨水。可以在非常大的 PVC 范围内配制得到具有优异的耐污渍性和耐擦洗性的涂料产品。其主要性能如**表 1** 所示。

如**图 1** 的 AFM 图像所示，Acronal ECO 7653 与单一相的标准丙烯酸聚合物分散体相比具有多相颗粒形貌（在每个聚合物颗粒中具有硬的和软的结构区域）。在标准丙烯

BASF's latest innovation for Premium Interior water based paint, Acronal® ECO 7653, is an advanced polymer dispersion for near-zero VOC paints that demonstrates excellent film properties. Its carefully balanced polymer composition and multiphase morphology provide strong films better able to resist stain penetration. When properly formulated with other efficient and low VOC additives from BASF, excellent GB stain resistance is observed even at a PVC higher than typical market benchmarks. With TVOC levels and odour significantly reduced, consumers will experience the improved health and fresh air benefits when painting with coatings formulated with Acronal ECO 7653.

Interior paints, Acronal ECO 7653 dispersion design

The China decorative water borne interior paint market is diverse and evolving. Ease of application and value for money have been the primary factors considered by virtually all customers since the beginning. In the past, consumers were willing to tolerate smelly paints during the application and drying phases in their homes, workplaces and public spaces as the burden to bear for new and invigorating finishes. However, approximately 15 years ago, attitudes began to change as awareness grew of the health benefits in limiting individual's exposure to harmful substances. Growth in the repainting segment further underlined the expectation that new paints would contain fewer harmful and odour causing chemicals. Meanwhile, formulators naturally were continuing their search for additional paint performance benefits to entice the market. As a key supplier to the coatings industry, BASF recognised both situations and focused on creating a new product class whereby the polymer dispersion contained significantly reduced odour and the resultant paints improved stain resistance. The first generation of Acronal ECO was

表 1：Acronal ECO 7653 的物理性能
Table 1: Physical properties of Acronal ECO 7653

固含量 Solids content	46 ± 1	%
pH 值 pH	7.0 – 8.5	
粘度（Brookfield RVT 20 rpm #1, 23°C） Viscosity (Brookfield RVT20 rpm #1, 23°C)	1000 – 3000	mPa.s
最低成膜温度 Minimum film formation temperature	ca. 25	°C

酸类聚合物（**图 1a**）中观察到胶乳颗粒周围的清晰边界，这表明其成膜不够充分。颜色较浅的部分是胶乳颗粒表面上具有较高 T_g 的亲水稳定剂。相反，由 Acronal ECO 7653 制成的胶膜边界（**图 1b**）与标准丙烯酸酯胶膜的边界相比不太明显。由于软区域对成膜的贡献，人们观察到了成膜更好的乳胶膜（**图 1b** 中的深色区域）。软区域促进了来自不同粒子的聚合物链聚结，而且可以降低成膜助剂的需求量，制备得到的涂料具有更低的 VOC 和气味。硬区域（**图 1b** 中的明亮区域）为胶膜提供硬度并提高了耐擦洗性能。更均匀的乳胶膜也能通过防止污染物渗透而提高耐污渍性能。

为获得更好的成膜效果，通过工艺，Acronal ECO 7653 的粒径可以得到良好控制。通过动态光散射（DLS）测试得到其粒径比标准丙烯酸聚合物分散体的粒径约小 30nm 左右。

聚合物的组成会影响所制备涂膜的疏水性和吸水性，并进而影响其耐污渍性和耐擦洗性。用于稳定分散体的表面活性剂也可影响其性能。在 Acronal ECO 7653 中，通过对稳定体系的精确设计，其稳定性和疏水性得到了很好的平衡。

如**图 1** 所示，在标准丙烯酸聚合物中比 Acronal ECO 7653 中观察到更多的光亮区域，该区域由亲水性组分构成。因此，Acronal ECO 7653 更疏水。更疏水和更致密的涂膜使其具有更好的耐擦洗性和耐污渍性。

绿色及性能标准：构筑挑战

很多涂料的难闻气味来自于易挥发的有机化合物（VOC）。VOC 的存在或者是作为满足特定功能的必需

launched. We are pleased to introduce in this article the 3rd generation ECO product, Acronal ECO 7653.

Acronal ECO 7653 is an acrylic low odour polymer dispersion for Premium Interior near-zero VOC paints. It is APEO and ammonia free. It can be formulated across a broad PVC range with excellent stain and scrub resistances. A summary of its properties is given in **Table 1**.

As shown by the AFM images in **Figure 1**, Acronal ECO 7653 has a multiphase particle morphology – (hard and soft domains within each polymer particle) compared to a single-phase standard acrylic polymer dispersion. Clear boundaries around the latex particles were observed in the standard acrylic polymer (**Figure 1a**), showing the insufficient film formation. The light part is the hydrophilic stabilisers with higher T_g on the surface of the latex particles. On the contrary, the boundaries in the film made by Acronal ECO 7653 are more invisible compared to the standard acrylic (**Figure 1b**). A better film formation is observed contributed by the soft phase (the dark phase in **Figure 1b**), which promotes coalescence of the polymer chains from different particles, and can decrease the coalescent demand. Lower VOC and odour can be achieved in the resultant paint. Hard phase (the light phase in **Figure 1b**) provides the hardness of film, and improves the wet scrub resistance. The more homogeneous film also increases the stain resistance by preventing stain penetration.

To achieve better film formation, the particle size of Acronal ECO 7653 is well controlled by the process, with around 30 nm smaller than the standard acrylic polymer dispersion tested by dynamic light scattering (DLS).

The polymer composition influences the hydrophobicity and water uptake of the resultant paint film, which in turn

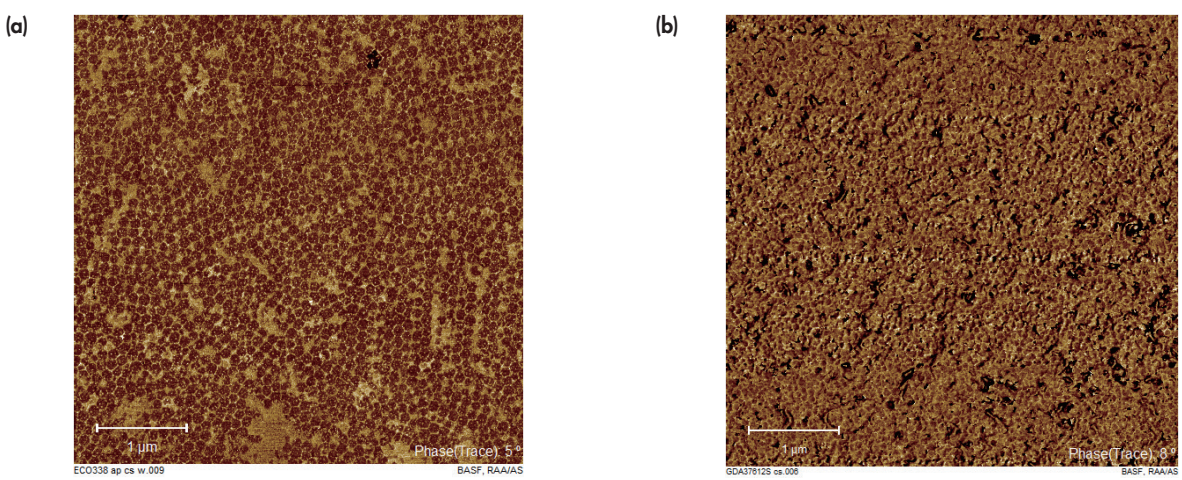

图 1：（a）标准丙烯酸聚合物和（b）Acronal ECO 7653 的原子力显微镜横截面胶膜形貌
Figure 1: Film morphology of (a) standard acrylic polymer and (b) Acronal ECO 7653 by AFM on cross section

表 2：中国分散体、内墙涂料和涂料的 VOC 排放限值
Table 2: VOC limitation of China dispersion, interior paint and paint emission

标准 Scheme	体系 System	VOC 限值 VOC limit	单位 Units	备注 Remarks
GB18582-2008	分散体 Dispersion	< 2	g/L	水除外 Water excluded
GB18582-2008	湿态涂料 Wet paint	< 120	g/L	水除外 Water excluded
JG/T 481-2015	湿态涂料 Wet paint	< 20	g/L	近零 VOC Near zero VOC
A	干燥涂料 Dried paint	< 3.0	mg/m^3	72 小时后 After 72 hours
A+	干燥涂料 Dried paint	< 1.0	mg/m^3	72 小时后 After 72 hours

表 3：中国内墙涂料应用标准
Table 3: Interior paint application standards in China

应用性能 Application	标准类别 Identifier	要求 Criteria
耐污渍性 Stain	GB/T 9780 -2013	>45，2 级 >45 Class 2
	GB/T 9780 -2013	>60，1 级 >60 Class 1
耐擦洗性 Scrub	GB/T 9266-2009	>5,000 循环，优质内墙涂料 >5,000 cycles premium interior
冻融稳定性 Freeze thaw	GB/T 9268-2008	通过 Pass
耐磨光性 Burnish	HGT4756-2014	85° 光泽差值 < 40, 60° 光泽差值 <10 ΔGloss < 40 @ 85°, if gloss @ 60° < 10

组分（例如赋予抗冻融性的丙二醇），或者来自于原材料的杂质（例如聚合物分散体中的残留单体）。前一种情况下，通过选择合适添加剂的智能配方工作，可以找到减少或消除 VOC 的替代物。对于后一种情况，针对降低来自原材料的挥发性有机化合物副产物人们作出了大量努力。巴斯夫率先采用先进的制造方法实现这一目标，并继续完善和改进 Acronal ECO 产品系列的这一能力。消费者对 VOC 的意识很强——他们可能无法确切了解 VOC 所代表的全称，但知道与气味，潜在的有害化学物质和能否通过产品绿色标签的关联很高。绿色标签是一个全球性的公认市场标准，旨在提高对环境可持续性的改善，和对其它标准的独立验证。全球生态标签网络组织 [1]，是旨在开发和推广可持续发展生态标签实践的全球组织协会。关于内墙涂料 VOC 的治定标准是建立在聚合物分散体和涂料配方中的最大允许浓度，以及在既定条件下可以排放的最大浓度。**表 2** 显示中国的例子。

中国国家标准也提供了使用已建立的方法客观评估涂料应用性能的框架，包括耐污渍性、耐擦洗性、抗冻融性和低温成膜性。**表 3** 所示为中国国家标准中有关耐污渍性、耐擦洗性、冻融稳定性和耐磨光性的性能测试标准。

要同时满足 VOC 排放限制要求和国标中对涂膜性能要求构成了一个大的挑战。在中国，消费者重新涂装的频率比以往更为频繁，因此，对于没有涂料气味且性能良好的涂料的期望非常高。在本研究中，购买了两种在中国出售的内墙涂料（参照 A 和参照 B），并与采用 Acronal ECO 7653 配制的涂料进行性能对比测试。Acronal ECO 7653 涂料的 PVC 为 50%，而基于固体和灰分含量，市售产品的 PVC 较低，分别为 44（参照 A）和 42（参照 B）。Acronal ECO 7653 的固有耐污渍性使配方设计师在更高的 PVC，更低的 TVOC 和潜在的成本效益方面具有灵活性。

国标的耐污渍性是根据 150 微米厚度的未沾污的涂层和沾污后经 200 次皂液洗涤循环的涂层区域的反射指数差异计算得到的。详细结果如**图 3** 所示。

can affect the stain and scrub resistances. The surfactants used to stabilise the dispersion can also influence the performance. In Acronal ECO 7653, the stabilising system was precisely designed to have a balance between stability and hydrophobicity. As shown in **Figure 1**, much more light phase was observed in the standard acrylic compared to Acronal ECO 7653, which was composed of hydrophilic components. Thus, Acronal ECO 7653 is more hydrophobic. The more the hydrophobic and dense film, the better the wet scrub resistance and stain resistance.

Green and performance standards. Framing the challenge

Much of the unpleasant odour from paints consists of Volatile Organic Compounds (VOCs) - present as either necessary components that fulfill a specific function (e.g. propylene glycol that imparts freeze thaw resistance), or as impurities in raw materials (e.g. as residual monomers from the polymer dispersion). In the former case, with smart formulation work using the right additive selections, substitutions can be found to reduce or eliminate the VOC contribution. For the latter case, much effort is made to reduce the VOC by-product contributions from the raw materials. BASF pioneered advanced manufacturing methods to this aim, and continues to refine and improve this capability for the Acronal ECO family. Consumer awareness of VOCs is strong – they may not be able to expand the acronym but the associations to odour, potentially harmful chemicals and avoidance via product Green labelling is high. Green labelling is a global marketing tool signaling improved environmental sustainability, and independent verification per known and agreed standards. The Global ECO Labelling Network[1], is an association of organisations worldwide that develop and promote sustainable ECO labelling practices. Governance regarding Interior Paints VOCs is built around maximum allowable

表 4：使用的 PVC 50% 的 Acronal ECO 7653 涂料起始配方
Table 4: Acronal ECO 7653 PVC 50% starting point formulation

组分 Ingredient	具体描述 Description	质量（克）Mass (g)
水 Water		187.00
Dispex® AA 4140	分散剂 Dispersant	4.50
Dispex CX 4320	分散剂 Dispersant	2.40
Dispex Ultra FA 4480	润湿及分散剂 Wetting & Dispersing agent	1.50
Foamaster® MO NXZ	消泡剂 Defoamer	2.00
Natrosol® 250HBR	增稠剂 Thickener	2.50
Silquest® BS 16	pH 调节剂 pH adjustor	2.00
R-706	二氧化钛 TiO_2	210.00
Omaycarb 2	碳酸钙 $CaCO_3$	100.00
DB-80	煅烧高岭土 Calcined Kaolin	74.00
Foamaster® ST 2410	消泡剂 Defoamer	2.00
Acticide® MV	罐内杀菌剂 In can biocide	1.00
AA148	罐内杀菌剂 In can biocide	3.00
Loxanol® CA 5290	成膜助剂 Coalescent	16.56
Acronal ECO 7653	粘接料 Binder	317.11
AQACell® HIDE 6299	遮光剂 Opacifier	50.00
Strodex® FT68	防冻融剂 Anti-freeze	3.00
Rheovis® HS1212	增稠剂 Thickener	5.01
水 Water		16.42
总量 Total		1000

耐磨光性能根据 HGT4756-2014 标准测试——对于 60° 光泽度磨光前后差值要小于 10 单位，对于 85° 光泽度磨光前后差值要小于 40 单位。

Acronal ECO 7653 涂料与市场参照涂料性能对比

本研究中使用的 PVC 50% 的 Acronal ECO 7653 涂料配方如**表 4** 所示。

配制产品时，需要从近零 VOC 和应用性能的角度考虑，选择具有高性能，低 VOC 含量和低气味的配方添加剂——例如，BASF 的成膜助剂 Loxanol CA 5290 几乎不含 VOC，并在低温下可以得到不粉化的涂膜。采用 Strodex FT68 替代丙二醇可以在接近零 TVOC 时保持良好的抗冻融性。与使用更多标准添加剂的类似配方相比，改变成这种添加剂可将总 VOC 含量降低 90%以上。

TVOC、气味等级和国标的耐污渍性如**图 2~3** 及**图 5** 所示。

总 VOC 值

Acronal ECO 7653 涂料的总 VOC 值 (TVOC) 是参照 B 涂料的 1/10 和参照 A 涂料的 1/100，对减少涂料中潜在的有害化合物有明显的改善。参照 B 确实符合**表 2** 所示

concentrations in the polymer dispersions, maximum allowable concentrations in the paints (by segmentation) and maximum allowable limits regarding the emitted VOCs under given conditions. Examples for China are given in **Table 2**.

GB standards also provide the framework for objective assessment of the paint's application performance using established methods, including stain resistance, scrub resistance, freeze-thaw resistance, and low temperature film formation. Performance criteria for GB Stain and scrub resistances, freeze-thaw stability and burnish resistance is given in **Table 3**.

The VOC and emission limits combined with the GB paint film performance requirements frame the challenge. Consumers repaint more often than they used to in China and so expectations are high for a well performing finish without the paint smell. Two commercially available interior paints from China (Benchmark A and Benchmark B) were purchased and benchmarked against paint made using Acronal ECO 7653 during this work. The PVC of the Acronal ECO 7653 paint was 50%, whereas based on solids and ash contents the PVCs for the commercials are lower at 44 (Benchmark A) and 42 (Benchmark B). The inherent stain resistance performance of Acronal ECO 7653 allows the formulator flexibility in terms of higher PVCs, lower TVOCs and potentially formulated cost benefits.

GB stain resistance is calculated from the reflective index differences between areas of the 150-micron thick paint without stain, to that with stain following 200 soap wash removal cycles. Detailed results are shown in **Figure 3**.

Burnish resistance is tested from HGT4756-2014 – for paints with 60° gloss less than 10 units, the gloss difference after burnish at 85° must be less than 40 units.

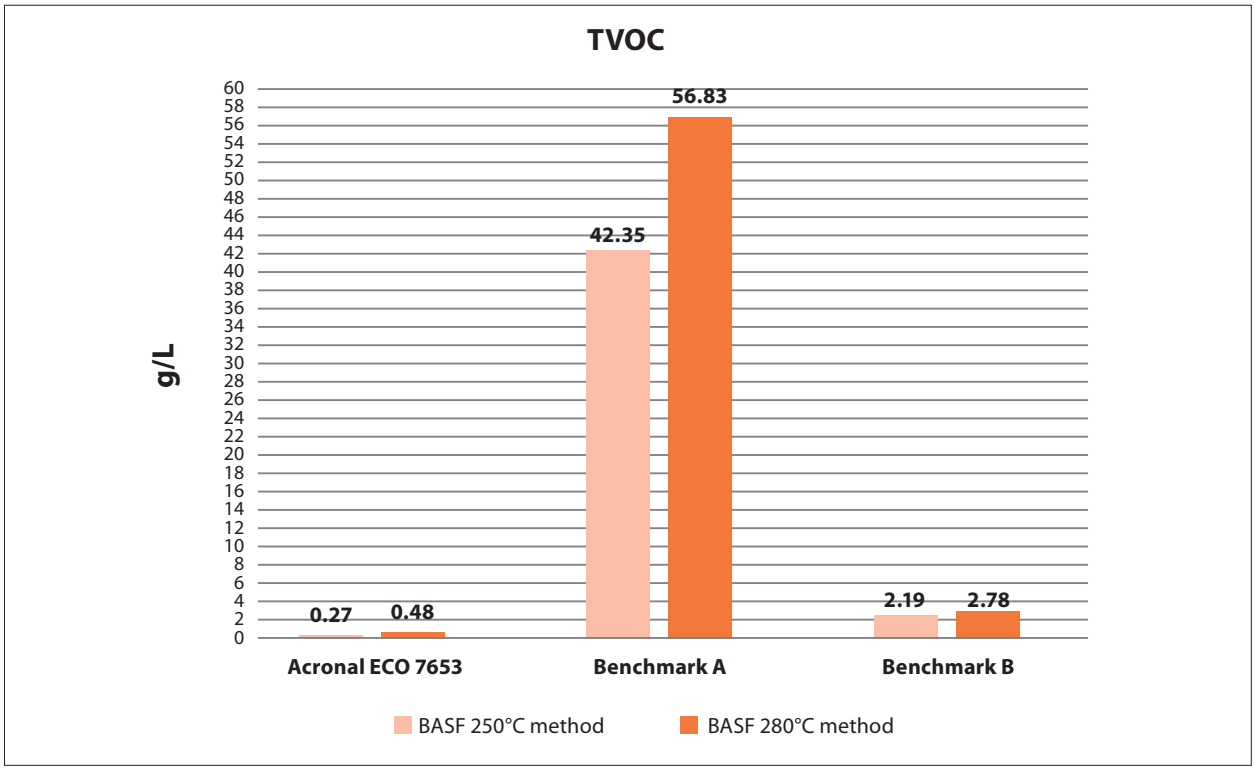

图 2：PVC 50% 的 Acronal ECO 7653 涂料、参照 A 和参照 B 涂料的 TVOC 含量
Figure 2: TVOC levels of Acronal ECO 7653 PVC 50%, Benchmark A and Benchmark B paints

的 JG / T 481-2015 标准 (<20 g / L) 的近零 TVOC 的要求，因此，Acronal ECO 7653 的表现在一个数量级以下是非常卓越的。Acronal ECO 7653 接近零 TVOC 的结果符合亚太地区如澳大利亚、新加坡和印度的内墙涂料其它绿色标签要求。

Acronal ECO 7653 paint performance compared to market benchmarks

The Acronal ECO 7653 PVC 50% formulation used in this work is given in **Table 4**.

When formulating, considerations are necessary

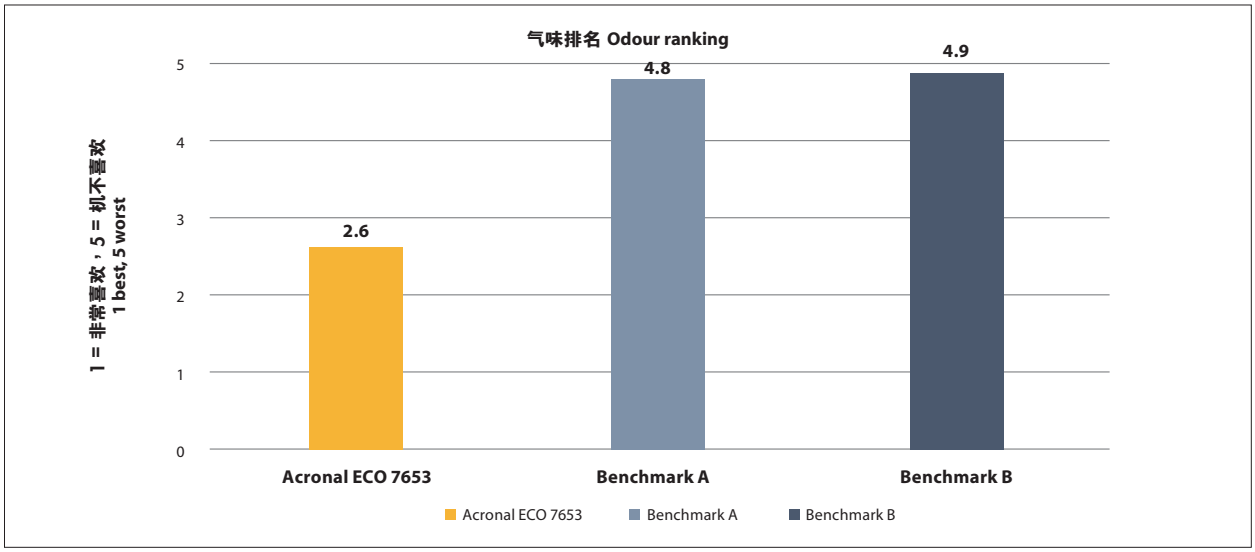

图 3：涂料的气味排名 1「非常喜欢」至 5「极度不喜欢」— 得分越低越好
Figure 3: Odour ranking 1 "like extremely" to 5 "dislike extremely" of the paints – the lower the score the better

图 4：正在进行的气味嗅觉测试
Figure 4: Odour sniffing test in progress

气味

涂料的气味由 10 人评分，分数从 1（非常喜欢）到 5（极度不喜欢），如**图 3** 所示。**图 4** 所示是我们小组成员对我们所选定产品的气味进行评估和测试的情况。

由于 VOC 的排放降低，Acronal ECO 7653 与商业涂料相比具有更低的气味。当（重新）涂装时，消费者从而感受到清新的涂装经验，因此，低气味自然成为消费者高度重视的一个特性。

耐污渍性

国标的耐污渍性是根据 150 微米厚的未沾污的涂层和沾污后经 200 次皂液洗涤循环后的涂层区域的反射指数差异计算得到的。国标污渍为蓝黑墨水、水溶性黑色素溶液、醇溶性黑色素溶液、凡士林炭黑混合物、食用醋、红茶。虽然腊笔不包含在国标的污渍要求中，我们也同时评估了对蓝色腊笔的耐污渍性的表现（**图 6**）。Acronal ECO 7653 涂料的国标耐污渍性是所测试的三种涂料中最高的，而且轻松地符合如**表 3** 所示 GB / T 9780-2013 的 1 类要求 (> 60)。通过采用精心设计的 Acronal ECO 7653 聚合物分散体，可以在高 PVC 情况下实现高耐污渍性。

from both near zero VOC and application performance perspectives. Formulation additives with high performance, low VOC levels and low odour were chosen – for example the BASF coalescent Loxanol CA 5290 is virtually VOC free and provides crack free films at low temperature. Substitution of propylene glycol with Strodex FT68 maintains good freeze thaw resistance at near-zero TVOC. Such additive changes reduce the total VOC by over 90% compared to a similar formulation using more standard additives.

TVOC, odour ranking and GB Stain resistance are shown in **Figures 2~3** and **Figure 5**.

TVOC

The Acronal ECO 7653 paint TVOC is 1/10th of Benchmark B, and 1/100th of Benchmark A, a clear and stark improvement in the reduction of potentially harmful compounds present in the coatings. Benchmark B does meet the near zero TVOC requirement from the JG/T 481-2015 standard (< 20 g/L) as stated in **Table 2**, thus Acronal ECO 7653's performance at an order of magnitude lower is quite remarkable. Acronal ECO 7653's near zero TVOC result is compliant with other Green Labelling requirements for Interior paints in Asia Pacific, for example Australia, Singapore and India.

Odour

The odour of the paints was also assessed according to the ranking of 10 individuals from 1 (like extremely) to 5 (dislike extremely), as shown in **Figure 3**. **Figure 4** shows how our panelists evaluate and test the odour of our selected products.

Acronal ECO 7653 paint is lower odour compared to the commercial paints, naturally a property highly valued by the consumer due to the reduced VOC exposure and fresh air experience while (re)painting.

Stain resistance

GB stain resistance was calculated from the reflective index differences between areas of the 150-micron thick paint without stain, to that with stain following 200 soap wash removal cycles. The GB stains are blue black ink, water soluble nigrosine, alcohol soluble nigrosine, Vaseline black, vinegar

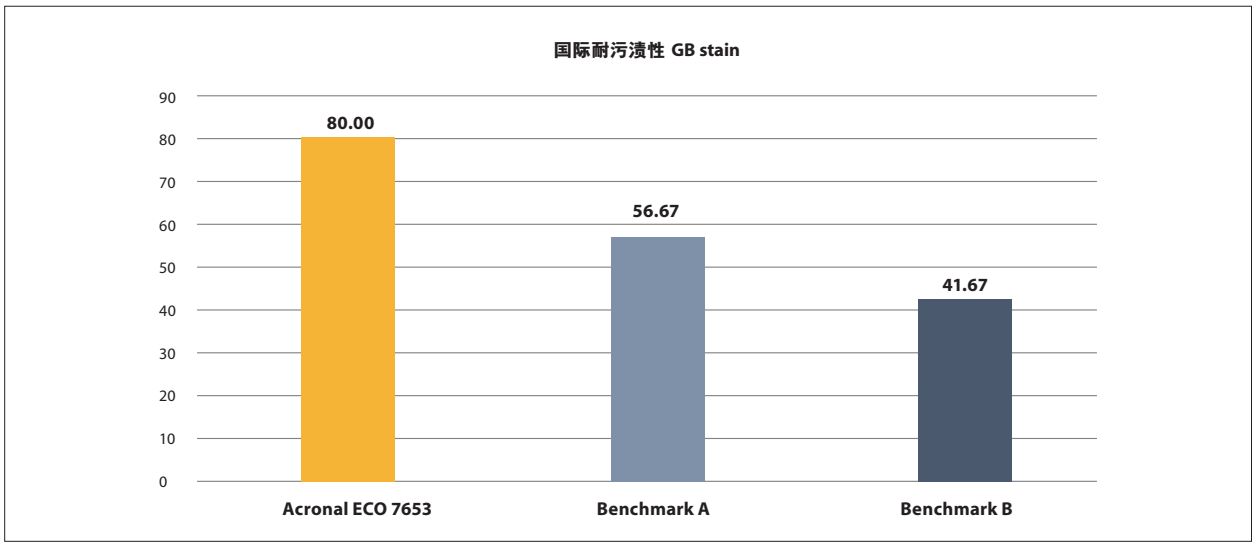

图 5：PVC 50% 的 Acronal ECO 7653 涂料、参照 A 和参照 B 涂料的耐污渍性
Figure 5: Stain resistances of Acronal ECO 7653 PVC 50%, Benchmark A and Benchmark B

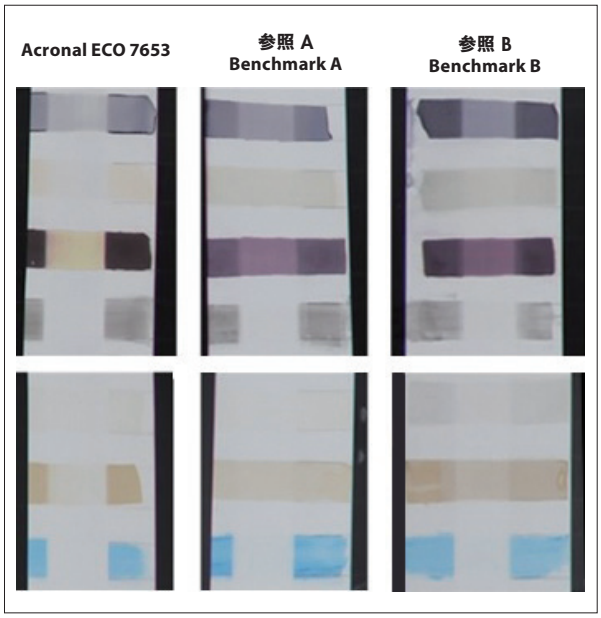

图 6：PVC 50% 的 Acronal ECO 7653 涂料、参照 A 和参照 B 涂料的耐污渍性。污渍从上而下的顺序为蓝黑墨水、水溶性黑色素溶液、醇溶性黑色素溶液、凡士林炭黑混合物、食醋、立顿红茶和蓝色蜡笔。
Figure 6: GB Stain resistances of Acronal ECO 7653, Benchmark A and Benchmark B. Stains in descending order are blue black ink, water soluble nigrosine, alcohol soluble nigrosine, Vaseline black, vinegar, Lipton black tea and Blue crayon at bottom

耐磨光性能

配方显示出良好的粘度稳定性而且符合国标耐擦洗要求。耐磨光是涂料的重要特性，表明干燥涂膜抵抗干磨的效果。如**图 7** 所示，PVC 50% 的 Acronal ECO 7653 涂料的光泽度变化结果介于两个市售参照产品之间，远低于**表 3** 中所列的 40 个光泽度单位变化的要求。

结论

为响应消费者日益增长的降低 TVOC 排放同时改善涂料性能的意识，BASF 推出了 Acronal ECO 系列产品。Acronal ECO 7653 是用于近零 VOC、耐污渍涂料的最新一代聚合物分散体，其由粒径细小的多相聚合物粒子组成，具有更强的胶膜内聚力和强度。由 Acronal ECO 7653 配制的涂料可使用低的 VOC 添加剂如 Loxanol CA 5290，其 TVOC 与市场标杆相比，可低至两个数量级，符合中国和亚太地区的绿色标签标准。即使在相对市场标杆较高的 PVC 下，由 Acronal ECO 7653 制备的涂料也展现出优良的 GB 耐污渍性。随着重涂板块的增长，人们期望在更低的涂装气味下具有更好的性能，Acronal ECO 7653 因而成为优质近零 VOC、耐污渍内墙涂料的良好选择。

致谢

我们要感谢 Yong Chee Seng、Vivek Gupta、Henry Wang 和 Kin-Sum Kong 对本研究工作的支持和建议。

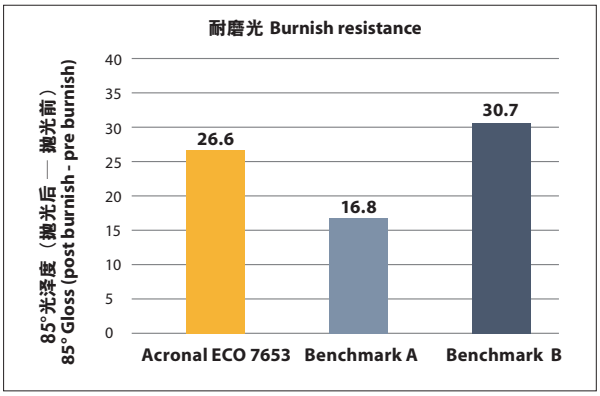

图 7：PVC 50% 的 Acronal ECO 7653 涂料，参照 A 和参照 B 涂料的耐磨光性能（85° 光泽度变化值）
Figure 7: Burnish resistance (85° gloss change) of Acronal ECO 7653 PVC 50%, Benchmark A and B

and black tea. Please note that while not included in the GB stain numerical value, the resistance to blue crayon was also assessed visually as shown in **Figure 6**. The GB stain resistance of the Acronal ECO 7653 is the highest of the 3 paints tested, and comfortably meets the Class 1 GB/T 9780-2013 requirement (>60) from as mentioned in **Table 3**. This high Stain resistance at high PVC is achieved through the careful design of the Acronal ECO 7653 polymer dispersion.

Burnish resistance

The formulation shows good viscosity stability and meets the GB scrub requirements. Burnish resistance is an important paint property that indicates how the dry film will resist dry polishing. As shown in **Figure 7**, the PVC 50% Acronal ECO 7653 paint has a gloss change result between the two Commercial benchmarks and is well below the 40 gloss units change requirement in **Table 3**.

Conclusions

BASF responded to growing consumer awareness of reduced TVOC exposure coupled with improved paint performance with the launch of the Acronal ECO range. Acronal ECO 7653 is the latest generation polymer dispersion for near zero VOC stain resistant paints, consisting of fine particle size multiphase polymer particles for improved film coherence and strength. Paints made from Acronal ECO 7653 can be formulated using low VOC additives such as the coalescent Loxanol CA 5290 with a TVOC up to two orders of magnitude lower than Commercial benchmarks, meeting with confidence green labelling standards for China and countries across Asia Pacific. Paints made from Acronal ECO 7653 show excellent GB stain resistance, even at a higher PVC, compared to the market benchmarks. Given the growth in the repainting segment driving high expectations of improved performance at lower applied odour, Acronal ECO 7653 is an excellent binder choice for premium Interior near zero VOC stain resistance Interior paints.

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References

[1] https://www.globalecolabelling.net/eco/eco-friendly-products-by-category/