Ti-Pure™

Uncovering a Critical Missing Piece of the Coatings Durability Equation

Chemours™

Maximizing a coating's durability is a complex equation that must account for multiple factors. Making matters even more challenging is the fact that formulators have been missing a critical piece of information about how titanium dioxide (TiO_2) can influence durability – until now.

Today's paint producers and formulators are under heightened pressure to create highly durable coatings for exterior architectural and industrial applications capable of standing up against harsh UV rays, rising temperatures, and severe weather events. At the same time, many applications also demand greater efficiency via longer-lasting coatings that increase the length of service before recoating and reduce material and labor costs.

TiO2, a critical component of high-quality, highly protective coatings, is known to have several effects on paint durability that must be considered by formulators. As a strong UV light absorber, TiO_2 protects underlying resin from direct interactions with the UV component of sunlight. However, TiO_2 can convert some of the UV light energy into chemical energy in the form of radicals, which can then attack the binder or react with other molecules at the surface that can lead to further paint degradation. In addition to the inherent photoactivity of the TiO_2 pigment, the degree of TiO_2 dispersion also plays an important role in determining a paint's durability.

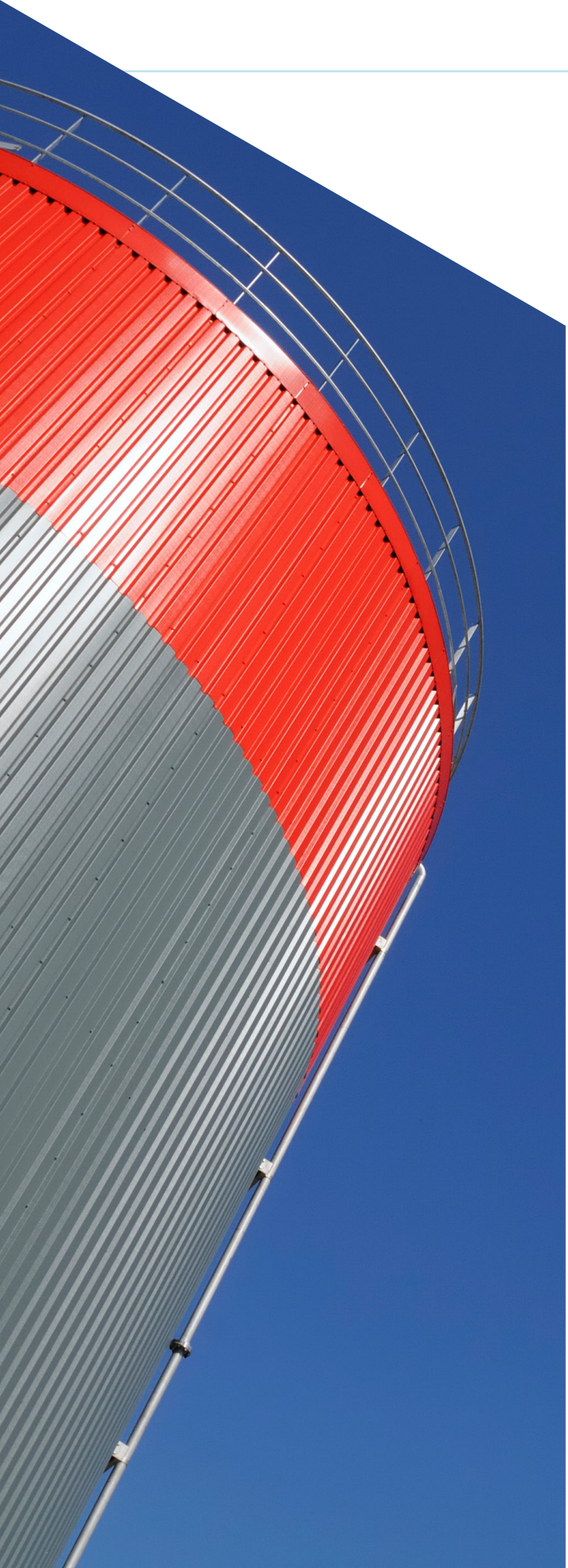
> It's logical for formulators to assume that by decreasing the photoactivity they can create a more durable coating. However, a more nuanced approach shows that TiO_2 grade can affect paint durability beyond simple TiO_2 photoactivity.

Closing a crucial information gap

It has been previously established that initial paint gloss – a paint characteristic that is highly representative of pigment dispersion – has an effect on gloss retention independent of TiO_2 photocatalytic activity. However, the effect of degree of dispersion on color stability (fade) of paints has not been studied in the same way. This is because the durability of paints with poor TiO_2 dispersion are seldom measured. Durability testing is expensive and time-consuming, whereas TiO_2 opacity testing – which is also related to degree of dispersion – can be used to identify and reject poorly dispersed paints quickly and for little cost.

> As such, there is limited information available that separates the effect of TiO_2 dispersion on paint durability from the effect of TiO_2 photocatalytic activity. This information gap has made creating coatings that maximize paint durability challenging for formulators.

In order to create high-quality paints that provide a high level of protection from the elements, formulators must fully understand the relative importance of photoactivity and TiO_2 dispersion on paint durability. At Chemours, we wanted to measure and quantify this relationship to help formulators make the highest-quality products possible. To do so, we conducted an experiment to shine a light on this process and uncover exactly how the degree of TiO_2 dispersion can affect color stability, a critical aspect of a coating's durability.



Unexpected results

In a series of experiments, we produced numerous TiO_2 slurries with experimental TiO_2 pigments that had a variety of surface treatments, including some for which a photocatalysis inhibitor was added at different levels and others for which a dispersion enhancing agent was added. The effects of these different surface treatments on paint durability were then determined by incorporating the slurries into a standard architectural paint formula that was tinted blue and exposed under accelerated natural conditions in Arizona.

This experiment was intended to separate the effect of TiO_2 dispersion on paint durability from the effect of TiO_2 photocatalytic activity. A statistical analysis of the results showed that the effect of degree of dispersion on paint durability can outweigh the effect of pigment photocatalytic activity. Compared to photoactivity, the degree of dispersion in these paints contributes to approximately 52% of a paint's overall performance, significantly outweighing the 37% contributed by TiO_2 photoactivity.

Estimated Contributions to Sample-to-Sample Performance Difference

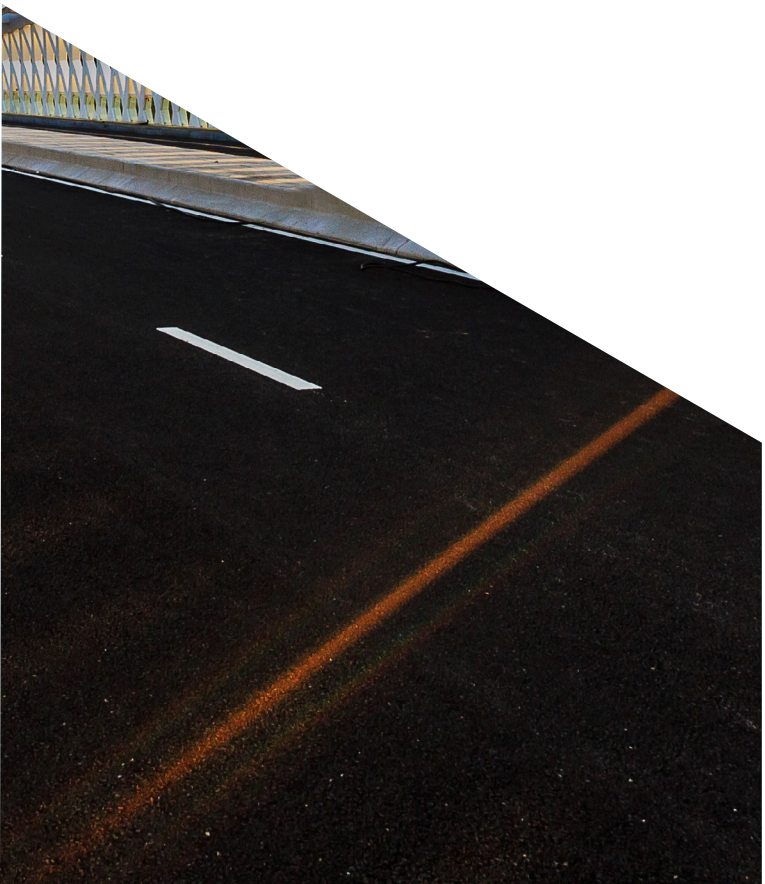
Contributor	Approximate Contribution
Degree of Dispersion	52%
TiO_2 Photoactivity	37%
Test Variability	11%

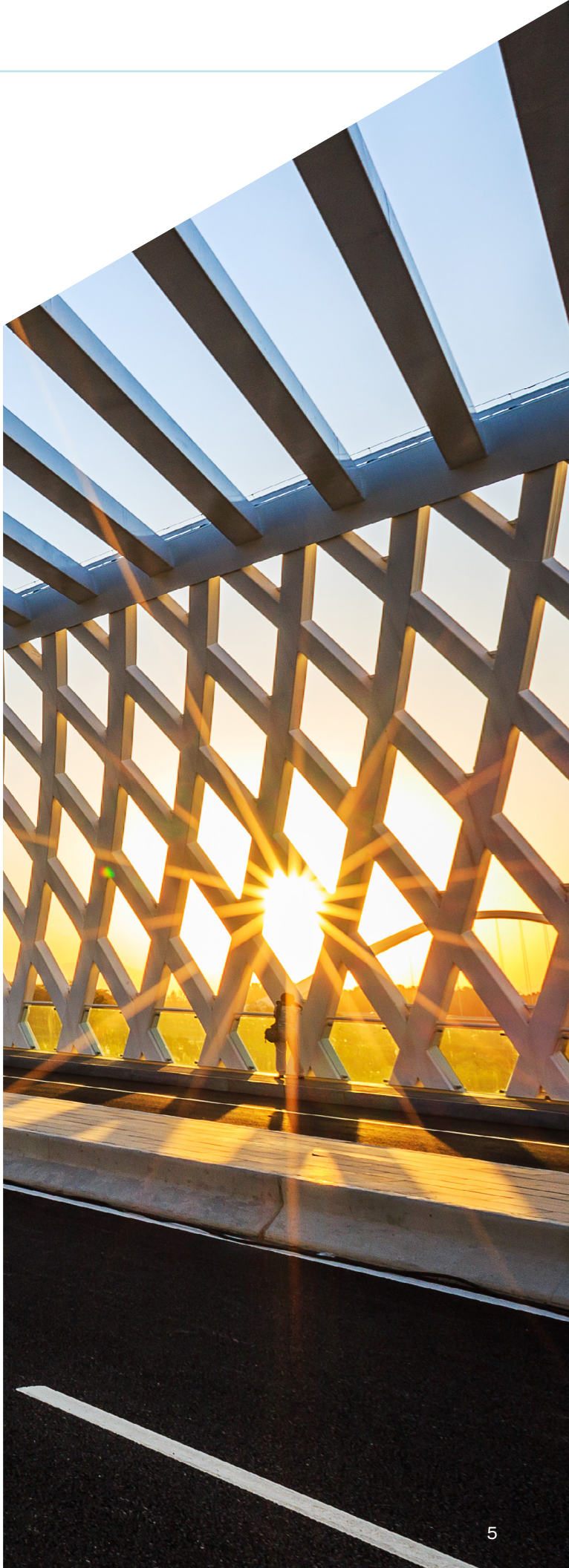
As a result of this analysis, we found that improving dispersibility, in addition to decreasing photocatalytic activity, is a promising avenue for improving durability. This approach has the added advantage of increasing paint opacity, and must be considered by formulators seeking to maximize the durability of their products.

Arming formulators with value-adding information

Producing highly durable coatings is complicated and requires close attention to the materials and processes used in the paint's manufacturing. As durability continues to remain a priority for architectural and industrial applications, the industry must more deeply understand how the various components of their products interact and affect overall performance – especially as severe weather events, rising temperatures, and harsh UV rays continue to intensify.

At Chemours, we're committed to providing our customers with information that allows them to innovate in ways that improve the quality of their products. Through this discovery, paint formulators can make more informed decisions and can more easily and economically create highly durable products that meet the specific requirements of their end customers.





Ti-Pure™

About Ti-Pure™ Titanium Dioxide from Chemours

Ti-Pure™ titanium dioxide (TiO_2) from Chemours strives to make the world brighter, more durable, and efficient by tackling some of society's greatest challenges through TiO_2 innovation and reliability. For nearly a century, we have produced and delivered high-quality TiO_2 for customers around the globe in coatings, plastics, and laminates applications. Guided by industry-leading innovation, technical expertise, and continued collaboration, we're committed to moving our customers and our planet forward.

Watch a short video to learn more.

Paints that contain Ti-Pure™ offer:

- **Better Processability**: High-quality Ti-Pure™ TiO_2 pigments ensure consistency from batch to batch.
- **Superior Hiding Power:** Creating brighter brights and whiter whites, Ti-Pure™ increases hiding power for uniform, one-coat coverage without needing to prime.
- **Ease of Application:** With fewer drips, smoother brush strokes, and faster drying times, Ti-Pure™ pigments boost paints' productivity.
- **Uncompromising Endurance:** The UV protection afforded by Ti-Pure™ leaves a durable, washable surface that resists fading, cracking, and discoloration over time.

For more information, visit **tipure.com** or contact us at **tipure.com/en/contact-us.**

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