Smog-Eating Buildings?

It's not science fiction. It's the innovative science behind Reynobond® with EcoClean™.

**A pro-active coating powered by free radicals**

The air-cleaning properties of Reynobond with EcoClean, powered by HYDROTECT, begin with the reaction created by titanium dioxide when exposed to sunlight. When sunlight strikes a particle of titanium dioxide, electrons within the particle become excited, creating a higher state of energy within the electrons. The energized electrons transfer energy to water in the air and form free radicals, 

• \( \text{OH} \) (hydroxyl radicals) and \( \text{O}_2^- \) (superoxide anions). These free radicals are both powerful oxidizers that can attack any organic material either on the panel's surface or floating near it.

**Transforming the pollutants in the air**

Of course, buildings are exposed to many organic contaminants. From bird residue to diesel fumes, architectural building panels are constantly exposed to organic material that makes their surfaces appear dirty.

Yet there's another kind of organic material constantly bombarding buildings that is harder to see: NOx (nitrogen oxides).

As the primary component of smog, NOx not only makes buildings dirty, but it also threatens the quality of the air we breathe. But when NOx molecules float near the surface of Reynobond with EcoClean, they are attacked by free radicals generated from the titanium dioxide reacting with water and oxygen in the air. The free radicals oxidize the NOx molecules, converting them to a harmless nitrate.

In this way, Reynobond with EcoClean constantly works to remove pollutants by using sunlight and the water vapor and oxygen in the air to clean the air itself.

**A water-loving surface that cleans itself**

Once the titanium dioxide has done its job and broken down and destroyed the nitrogen oxide and other organic matter on the Reynobond panel, its second major benefit – creating a super hydrophilic, or water-loving, surface – comes into play. Because the EcoClean coating is super hydrophilic, it makes the surface of the Reynobond super slick in the presence of water.

So when it rains, water doesn't bead on the surface but instead collapses and runs evenly off the building, taking most of the broken-down organic matter and nitrates with it. Even the slightest amount of rain creates the effect, so the building is constantly washed clean of contaminants. That means lower maintenance costs for owners, and a consistently cleaner image for the building over time.
“Build a building, save the world.”

It’s the mantra that drove the development of Reynobond with EcoClean. Alcoa combined science, application and decades of architectural experience to create a product that makes a positive impact on the environment.

Scientifically Speaking
A Q&A With Alcoa Staff Scientist Paula Kolek

Q: What makes Reynobond® with EcoClean™ coating so innovative?
A: No one has been able to provide this type of coating on a painted aluminum surface before. Titanium dioxide doesn’t discriminate when it comes to thinking it has found an organic contaminant. It would consider the paint underneath an organic contaminant. Part of the Alcoa innovation is that we’ve figured out a way to protect the paint, maintain the appearance of the painted surface and give architects and building owners all the benefits of the titanium dioxide. And we have figured out a way to apply it cost effectively and uniformly.

Q: What are the key benefits of Reynobond with EcoClean coating?
A: The first is its self-cleaning properties. It’s a byproduct of what this coating does by creating a hydrophilic, or water-loving, surface. When the coating is exposed to sunlight, water sheets off the surface and takes the dirt with it. So, as long as your surface is exposed to rainwater and sunlight, dirt will wash away. Secondly, and perhaps more importantly, the titanium dioxide coating attacks the pollutants in the air, like nitrogen oxide. So, if you’re an architect or building owner who is concerned about the environment, Reynobond with EcoClean is a great product for you.

Q: Are the reductions in nitrogen oxide (NOx) caused by Reynobond with EcoClean coating measurable?
A: Yes. We’ve measured it in a laboratory at the Alcoa Technical Center. We have test panels and a small chamber where we put the sample in the chamber, and then pass a gas containing nitrogen oxide over it. When you turn the light on, you can watch that NOx level drop. So, what’s happening is that at the surface, we have some humidity in the air, we have oxygen in the air, and those are converting the nitrogen oxide to nitrate. We have also conducted studies outdoors and have seen real-life reductions. Based on these studies, NOx is reduced at a rate of 5.5 milligrams per square meter per day.

TOTO’s patented HYDROTECT™ technology protects our planet by drawing on sunlight, rainwater and other natural forces to help cleanse the global environment. Alcoa’s breakthrough was determining how to apply that technology to pre-painted metal – creating the EcoClean coating.

Advantage: Image

How Reynobond with EcoClean creates new opportunities for designs that make an impact

For architects, buildings are more than simple structures – they’re an opportunity to create a strong brand for their owners and the businesses that occupy them by projecting a strong and unique image to the marketplace.

In this world, where the quality of corporate image can mean the difference between success and failure, Reynobond with EcoClean creates two distinct advantages.

The self-cleaning properties of Reynobond with EcoClean help decrease building cleaning costs over the life cycle of the structure. As the façade of a typical building gets dirty, its finishes eventually degrade, leading to a less attractive structure – and a less attractive brand. Because the EcoClean coating is an active coating, constantly working to break down those organic materials that come into contact with its surface, the surface works to help clean itself every day and to wash away organic material with even the slightest amount of rain. This ensures that the image is never tarnished, and that the return on investment for the building is maximized.

Perhaps of even greater value to corporate image is Reynobond with EcoClean’s ability to clean the air. Unlike other “green” products that are called such because they are recyclable or are made with recycled materials, Reynobond with EcoClean is an active green product that continually breaks down nitrogen oxide in the air when exposed to sunlight. For companies looking to enhance their image by showing a strong commitment to improving the environment, choosing Reynobond with EcoClean creates a brand story that is even more attractive to consumers.

10,000 square feet of Reynobond with EcoClean has the approximate air cleansing power of 80 trees. That’s enough cleaning power to offset the smog created by the pollution output of four cars every day.

eyeclean.com
At Alcoa, Excellence in Innovation is far more than a slogan. It’s a promise we fulfill every day by researching and developing new products that can make a positive impact on our customers and our world.

The innovations behind Reynobond® with EcoClean™ are emblematic of this commitment. Alcoa began developing the coating technology in 2006, committing a team of more than 50 scientists and engineers to create a way to apply titanium dioxide to painted aluminum using a coil-coating process that would deliver all the self-cleaning and air-cleaning benefits of titanium dioxide without its attacking the painted surface itself.

The result of the team’s work was the creation of the world’s first affordable, nearly transparent coating for painted aluminum that actively interacts with the environment to remove the key ingredient of smog from the air.

The addition of Reynobond with EcoClean to Alcoa Architectural Products’ comprehensive line of quality cladding materials is yet another example of how our continual innovation is creating more opportunities than ever for architects and building owners to develop structures that are more creative, more efficient and more distinct in the marketplace.

Expect even more innovative products in the months to come.

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