

NEWS ALERT



Cortec® White Paper Explains the “Power of Diminishing Particle Sizes”

A new Cortec® white paper is now available detailing the advantages of Nano VpCI® Technology and explaining some of the science behind submicron VpCI® particles!

The paper, written by a subject matter expert from Cortec® Laboratories, explains how Vapor phase Corrosion Inhibitors (VCIs) protect metals from corrosion by releasing into the air and adsorbing onto metal surfaces. VCIs block corrosion at both cathodic and anodic corrosion sites, protecting against corrosive environments such as high humidity, temperature, and salt content.

Cortec® has been a global leader in this widely adopted technology over the last 40 years, developing a comprehensive suite of products under its VpCI® brand. Driven by excellence and inspired by the recent trend in nanotechnology, Cortec® has also developed Nano VpCI® products with unprecedented capabilities. This state-of-the-art technology is based on the power of its submicron VpCI® particle size and provides the following benefits:

- Superior vapor phase protection at low product dosage
- Multi-metal vapor phase protection
- Fast diffusion to metals
- Fast buildup of protective vapor in environments

The paper concludes by commenting that Cortec’s Nano VpCI® Technology has added another dimension to the tremendous success of nanotechnology in academic, commercial, and industrial realms in the last two decades. It is described as an “all-win choice” for those in search of reliable long-term corrosion protection all around the world.

Please continue to read the full white paper!

Cortec® Corporation is the global leader in innovative, environmentally responsible VpCI® and MCI® corrosion control technologies for the Packaging, Metalworking, Construction, Electronics, Water Treatment, Oil & Gas, and other industries. Headquartered in St. Paul, Minnesota, Cortec® manufactures over 400 products distributed worldwide. ISO 9001 and ISO 14001 Certified, and ISO 17025 Accredited.



Power of Diminishing Particle Sizes

Overview

Vapor phase Corrosion Inhibitors (VCIs) are a unique type of solid or liquid based corrosion inhibitor. They protect against metal corrosion without needing direct physical contact with the metal. Upon application of the VCI product, volatile corrosion inhibitor molecules are readily released to the air, transported in vapor phase, and finally adsorbed onto metal surfaces. The VCI molecules block cathodic and anodic corrosion sites, thereby effectively mitigating corrosion activities of metals exposed to corrosive air environments such as high humidity, high temperature, and high salt content.

VCI has been widely adopted in industrial, manufacturing, and home settings to render cost-effective and efficient metal protection. Since its founding in 1977, Cortec® has been a global leader in VCI technology and has established a comprehensive suite of VCI products, under its VpCI® brand, covering a wide range of industries including oil and gas, electronics, water treatment, construction, etc. Driven by excellence, Cortec® has been devoting continuous research efforts to developing next-generation technology that will boost its impact in the corrosion engineering community to better meet customers' needs and those of the whole society.

Traditional VCI development strategy is to identify novel chemical structures via molecular design. Inspired by the recent trend of nanotechnology, a new type of materials-design strategy powered by manipulation of particle size has come to the attention of Cortec®, who has since uncovered unprecedented product capabilities utilizing nano-size VCI particles (refer to Cortec® product VpCI®-309 Nano for details).

Key Attributes of Cortec® Nano VpCI®

Cortec® Nano VpCI® displays an array of unique characteristics endowed by its finely tuned submicron particle size. Manufactured using proprietary micronizing technology, Cortec® Nano VpCI® has proven itself as a state-of-the-art product with superior corrosion inhibition performances in the following regards:

- Submicron particle size. The average particle size is 200 nm as opposed to 150 um for regular VCI powders manufactured via the routine approach.

- Superior vapor phase protection at low product dosage. As demonstrated by NACE TM 208 Vapor Inhibiting Ability (VIA) testing, use of Nano VpCI®-309 resulted in a corrosion-free metal surface at a dosage of 0.1 lb/m³ in a high relative humidity (95%) environment. In great contrast, more than 50% of the metal sample surface was corroded in a control test without the presence of VCI. Only several corrosion spots were identified on samples protected with regular size VpCI®-309 used at the same low dosage as the Nano version.
- Multi-metal vapor phase protection. Misted Sand testing, which places metal panels above a sand bed injected with chloride solution, was performed to evaluate Nano VCI performance. The corrosion rate of steel without any protection increased continuously from 0.4 mpy to 2.4 mpy over the course of 2800 hours, while the corrosion rate of steel protected with Nano VCI remained at a low level of 0.3 mpy over the same period of time. Nano VpCI® also protected galvanized steel and 2024-T3 aluminum alloy effectively in the same test.
- Fast diffusion to metals. Laser Doppler Anemometry (LDA), a high resolution single-point technique for particle velocity measurements in turbulent flows, showed that particle velocity of Nano VCI was twice that of regular size VCI. The nanosize particles can travel longer distances due to greater buoyancy, smaller gravity, and easier transport. The advantage in velocity also makes Nano VCI an extremely suitable candidate for treating hard-to-reach spaces (e.g. interior cavities, recessed sections) within an enclosed space.
- Fast buildup of protective vapor in environment. Study of VCI adsorption on steel surfaces has shown that in comparison to normal size VCI particles, surface coverage of VCI on metals is enhanced with decreased particle size. Moreover, faster partial pressure buildup of vapor inhibitors is obtained with nanosize VCI. The fast kinetics of Nano VCI guarantees timely release of VCI vapor and protection of steel.

In the last two decades, nanotechnology received tremendous success not only in academia research but also in commercial and industrial realms. A myriad of products equipped with nanotechnology have become ubiquitous and indispensable in our lives. Recent development of Cortec® Nano VpCI® adds another dimension to the success of nanotechnology. Selection of Cortec® nano VpCI® will be an all-win choice for engineers, maintenance workers, contractors, and equipment owners all over the world who are in constant search of reliable and long-term protection methods for their properties.