



MIGRATING CORROSION INHIBITORS
FROM GREY TO GREEN

March 2023



The group at the Golden Knights Hockey game.

Learning and Growing at WOC 2023

Another World of Concrete (WOC) has come and gone, but we were happy to see many new faces and reconnect with those of you who made the annual trip to Las Vegas January 16th-19th. In addition to enjoying a Las Vegas Golden Knights hockey game together with industry friends, we had a good time networking at the ICRI kickoff party on our first day in town.

On Tuesday, we packed a wealth of industry updates and knowledge-sharing into an hour-and-a-half distributor and reps meeting. This was followed by some good days on the exhibit floor interacting with contractors, architects, suppliers, and others. While many guests were hearing about MCI® for the first time (with growing interest in the Latin America market), it was a special treat to

have some WOC attendees stop by just to tell us how happy they have been using the technology!

Thanks to all those of you who invested time and resources to be present with us. We wish you a successful concrete season in between now and our next WOC!

Kevin Quan Elected to Two ICRI Board Chapters!



Just 18 months after joining the Cortec® MCI® team, our MCI® Regional Sales Manager Kevin Quan had already been elected to the boards of two ICRI (International Concrete Repair Institute) chapters on the East Coast! This transition to leadership naturally developed as Kevin displayed a high level of interest and active engagement in many ICRI events since becoming a member in September 2021, giving colleagues confidence in Kevin's understanding of ICRI membership value and his ability to promote it to others.

For 2023, Kevin will serve on the membership committee at the ICRI Delaware Valley Chapter. At the Baltimore/Washington DC Chapter, he will co-chair the golf committee and newsletter and communications committee for a nice change of pace. This deeper level of involvement will be a great way for Kevin to get to know the industry even better while also contributing to the success of others. What's more, Kevin believes that being on several boards at once will be a great way to share best practices with each chapter!

At left: Kevin in the field with his game face on—out on a concrete plant tour!

Bridge Builder's Day Meets in Person!

After two years of meeting digitally or cancelling altogether, Bridge Builder's Day 2023 met in person January 30th in Gothenburg, Sweden. Ivana Liposcak (MCI® Technical Sales Manager Europe) joined Nils Davant (NCI Sweden) and Øyvind Sartre (Presserv Norway) for the day to bring MCI® solutions to those involved in Swedish infrastructure and to learn more about Swedish and international projects. The threesome had a chance to mingle with a variety of exhibitors and organizations, including the Swedish road administration, representatives of the City of Stockholm, and a variety of consultants and entrepreneurs involved in bridge work.

The next day, January 31st, was Surface Protection Day, giving Ivana, Nils, and Øyvind more opportunities to meet with companies involved in concrete work. One of these organizations is planning to use MCI®-2020 in an upcoming mine project. Another company cleans water towers and already relies on Nils as a consultant.

Since nothing is quite the same as being face to face in the same room as other people, it was great to be back in Sweden once again for two days of networking with concrete and infrastructure professionals in the region!



Nils had the opportunity to use his steel wool demo bottles to demonstrate how MCI® inhibitors work.



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Educating the Next Generation of Civil Engineers!



Francisco Hidalgo of Codemet presented MCI® Technology to a large audience at the ACI ESPOL Civil Engineering Congress.

We were honored to have Francisco Hidalgo and his Codemet team sharing MCI® Technology at the ACI ESPOL (Escuela Superior Politécnica del Litoral, a public university in Ecuador) Civil Engineering Congress. He reported, “We continue to educate future civil engineers who are studying at three prestigious universities in Guayaquil. . . .” During the event, Francisco presented to a full audience, and we are grateful for his efforts to spread the word about MCI® and service life extension to the next generation of civil engineers!

From Concrete Repairs to Cornhole—Time for Fun and Business in Atlanta

Although the space between us and our time at the 2022 ICRI Fall Convention is rapidly growing, we still have many great memories from our days in Atlanta, Georgia, last November. The event turned out to be an outstanding venue for networking with everyone from engineers to students curious to learn more about MCI®.

Our team contributed to a number of committee meetings and got to take in technical sessions on everything from repair assessments after catastrophic events to repairs of mid-century modernist facades.

Social events like the awards luncheon were also highlights, and some of us even had time for cornhole and clay shooting! All in all, it

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was a satisfactory time to learn, grow, and collaborate with some of you and other key players in the industry.

We look forward to hopefully seeing even more of you this Spring (April 17th-19th) in Vancouver!






The MCI® team at the ICRI Fall Convention. Left to right: Ash Hasania (MCI® Technical Sales & Product Manager), Lisa Marston (Regional Tech Service Engineer), Jessi Meyer (VP Product Management & Technical Sales), Kevin Quan (MCI® Regional Sales Manager – East Coast).



New Resources

While we tried to share some of our newer resource updates with you at WOC, we also want to alert you to a wealth of recent online media we've published, and provide access to some of the previously mentioned material for anyone who may not have made it to WOC.

New Surface Prep Guide for MCI® SACIs

    			
Surface Preparation Guide for MCI® Products			
<p>Application of MCI® surface applied corrosion inhibitors (SACIs) for concrete can only start after properly preparing the concrete surface. This includes removal and replacement of non-durable concrete and/or repair of surface irregularities. Removal of all deteriorated or cracked concrete all the way down to sound concrete is recommended. Concrete repairs should be in accordance with professional engineering advice. Repairs should be allowed to cure before coating for best results. A 28-day cure for new concrete is preferred. Concrete and adjacent surfaces must be moist, dry clean, and free of all dust, dirt, oil, grease, laitance, efflorescence, scales, coatings, curing compounds, waxes, membranes, rubber tire marks, and asphalt. Cleaning can be done using steam cleaning, water blasting, sandblasting, or shot blasting. Use an air compressor with a water and oil trap to ensure the cleaning method does not apply materials intended for removal. Use a brush, broom, sweeper, or air compressor on surfaces for final cleaning before application.</p>			
Product	Coverage Rate	Recommended Surface Preparation	Remarks
MCP-2018	125-175 ft/gal (3.0-4.3 mL)	Mechanically prepare concrete substrate to obtain a surface profile of approximately 27-38 mils (0.7-1.0 mm) (CSP 1-3 per ICRI guidelines)	MCP-2018 may be applied to damp surfaces, although dry surfaces are preferred to achieve maximum penetration into the substrate.
MCP-2019	125-175 ft/gal (3.0-4.3 mL)		MCP-2019 can be used on concrete substrates that are pre-mixed with slane
MCP-2020	150 ft/gal (0.7 mL)	Clean and dry substrate before application.	If prior adhesion testing has not been performed, a water cure may be required prior to application of subsequent coatings or membranes.
MCP-2021	150-250 ft/gal (3.7-6.1 mL)	Mechanically prepare concrete substrate to obtain a surface profile of approximately 27-38 mils (0.7-1.0 mm) (CSP 1-3 per ICRI guidelines)	Apply two to five coats. Two coats are used; dosage rate per coat should be between 300-500 1/2" gal (5.4-12.2 mL). Apply the second coat and any additional coats immediately after the previous coat is dry to the touch (normal drying time is 15-30 minutes, depending on temperature). Apply only as much water as the surface will readily absorb. Overdosing MCP-2021 can cause the appearance of efflorescence while sulfate crystal formations on the surface of the substrate.
MCP-2022	125-175 ft/gal (3.4 mL)		After the first coat is applied, wet the entire treated area with a light water spray to assist in penetration and/or removal of any residual MCP-2021 and air cure thoroughly.
MCP-PCORE Series	125-175 ft/gal (3.4 mL)		MCP-2021 will not penetrate film-forming sealers, coatings, paints, membranes, or asphalt. A water cure should be made by spraying, brushing, or spraying until the surface is saturated. On horizontal surfaces, the liquid material should pond on the surface at least five seconds before being absorbed. On vertical surfaces, apply in a "flood" application from the bottom up so the material runs down and is retained (15-20 mils) below the spray pattern. Specially designed overhead and vertical versions can also be used. Curing requires 7-10 days.
<p>For best results, two applications are recommended, with the second application applied using a wet-on technique. During application, precautions should be taken to protect the surrounding area from overspray and run-off.</p>			
<p>For all products, if a subsequent application of a topical product requires more aggressive mechanical preparation (i.e., higher CSP profiles), use the same preparation method for MCP products.</p>			

This new resource is perfect for anyone involved directly in the application of MCI® surface applied corrosion inhibitors (SACIs) for concrete. The final performance of an MCI® SACI such as MCI®-2018 or MCI®-2020 can be directly impacted by the inadequate cleaning and preparation of the surface. This two-sided handout shares important guidelines such as product coverage rate, recommended surface prep, and additional remarks that help you get best results for specific products. You can access the guide online or download and print it on one sheet (front and back) to hand out to your customer.

Get it here: <https://www.cortecmci.com/surface-preparation-guide-for-mci-products/>



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Our Newest MCI® Repair Mortar Works on Vertical/Overhead Surfaces

If you've been wanting to use an MCI® enhanced repair mortar for vertical and overhead applications, now you have it! MCI®-2040 High Performance Vertical/Overhead Repair Mortar is the newest component of Cortec's High Performance Repair System (HPRS®) to make the most of concrete repairs by inhibiting corrosion and reducing the risk of the insidious ring-anode effect. MCI®-2040 is single-component, fast-setting, and high strength, giving you an easy-to-handle patching material for fast-paced repair jobs. It is a great idea for repairing concrete columns, soffits, retaining walls, and the undersides of bridge decks or balconies.

Learn more about it here: <https://www.cortecmci.com/product/mci-2040-high-performance-vertical-overhead-repair-mortar/>



New Demo Video: How to Apply CorrVerter® MCI® to Rusty Rebar

Next time you are trying to explain CorrVerter® MCI® as a rebar surface prep option prior to concrete repair, save yourself some time by sharing this two-and-a-half minute demo video. It takes you step by step through the rebar surface prep process: brushing off loose rust, applying CorrVerter® MCI®, recoating if needed, curing, and inspecting. It also includes an interesting time lapse that shows the primer drying from a creamy white to a black finish. Watch now and keep it in mind for your next user training! <https://www.youtube.com/watch?v=4GtnllwpdzQ>

An Intro to MCI® and Industry Standards

Industry standards are an excellent source of best practices recommended by the experts. Many new construction guidelines exist on the protection of reinforced concrete structures, and, finally, after almost two decades of preparation, we also have the first standard on surface applied corrosion inhibitors (SACIs). We recently compiled a listing of some of these standards and discussed how they relate to MCI® admixtures and SACIs. These overviews can be great resources for you or your engineering friends to consult. Learn more about these industry standards in our recent press releases!

MCI® and Standards for New Construction: <https://www.cortecmci.com/press-release-how-do-cortec-mci-admixtures-fit-into-standards-for-new-construction/>

MCI® and ICRI Standard for SACIs: <https://www.cortecmci.com/press-release-mci-surface-applied-corrosion-inhibitors-a-recognized-industry-standard/>



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MCI® Tips

Tips for Making the Most of MCI® Technology

Over the last several months or so, we've published a wealth of tips and ideas to help you make the most of MCI® Technology in your corner of the industry. These press releases and news alerts make great references for you and your clients. Here are some highlights!

How to Compensate for Common Concrete Application Errors with MCI®

This press release addresses some of the common human errors that can happen during a concrete pour and recommends specific MCI® products that can provide extra corrosion protection to help make up for the following mistakes:

- Forgetting to add corrosion inhibitor
- Insufficient concrete cover
- Honeycombing
- Rebar shifting

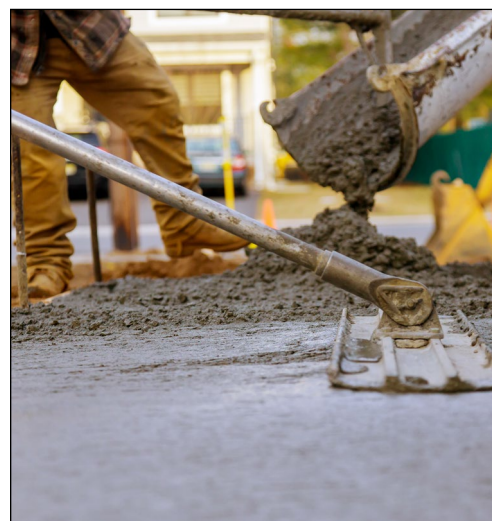
Find suggestions to compensate here: <https://www.cortecmci.com/how-to-compensate-for-common-concrete-application-errors-with-mci/>

Avoiding the Pitfalls of Improper CorrVerter® MCI® Application

Rust on rebar must be removed or passivated before doing a concrete repair to avoid serious adhesion or re-rusting problems. This news alert includes steps to successful rebar passivation with CorrVerter® MCI®, as well as best practices for post-application (e.g., inspecting coverage, DFT). Find it here: <https://www.cortecmci.com/news-alert-avoiding-the-pitfalls-of-rusty-rebar-with-proper-corrverter-mci-application/>

Countering Construction Material Shortages

Did you know MCI® can be used as a great alternative to certain construction materials that have faced supply chain shortages in the last couple of years? This news alert looks at how MCI® admixtures can come in handy when construction workers are short on calcium nitrite, galvanized/epoxy coated rebar, and pozzolans for corrosion protection. Read about these innovative alternatives here: <https://www.cortecmci.com/news-alert-mci-resilience-in-countering-construction-material-shortages/>





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Top MCI® Products for Historical Restoration

If you work on historical structures, you know how important it can be to use materials that don't change the look of the building—which is why MCI® can be such a good component for extending the service life of the repair. This press release looks at some of the top MCI® products for use in a historical concrete repair and also shares some interesting examples of past repairs on MCI® heritage projects. Read more: <https://www.cortecmci.com/top-mci-products-for-historical-restoration/>

Guide to Corrosion Protection During Construction Delays

Winter weather, budget constraints, material delays, and leadership changes can all interrupt the original timeline of a construction project. Unfortunately, this often leaves materials out in the open or otherwise unprotected and vulnerable to corrosion. This press release offers suggestions for protecting PT strands, exposed rebar, and various steel building materials lying out in the open: <https://www.cortecmci.com/news-alert-mci-guide-to-corrosion-protection-during-construction-delays/>

How to Mitigate Rebar Corrosion in Precast Concrete

Precast concrete is a high-quality material with a low risk of corrosion . . . until cracking occurs. This news alert offers ideas for pre-empting and responding to corrosion: <https://www.cortecmci.com/news-alert-how-to-mitigate-rebar-corrosion-in-precast-concrete/>

Value Engineering with MCI® SACIs

Value engineering is a big buzzword these days, but it makes sense to get the most value out of the limited resources one is able to put into a structure—even more so in these days of shortages and rising prices. One example is silane shortages. When the price is too high or the supply too small to allow the use of a silane water repellent on concrete, alternative options include using MCI®-2019, an MCI® SACI with less silane (40% silane), or MCI®-2020 (no silane) followed by a separate non-silane water repellent or coating. Get more ideas in these press releases. Value Engineering with MCI®-2019: <https://www.cortecmci.com/value-engineering-with-mci-2019-for-concrete-maintenance-and-repair/>; Value Engineering with MCI®-2020: <https://www.cortecmci.com/press-release-value-engineering-with-mci-2020-counteracting-shortages-cutting-costs/>



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MCI® Testing

A Peek Behind the Scenes at Cortec® Laboratories

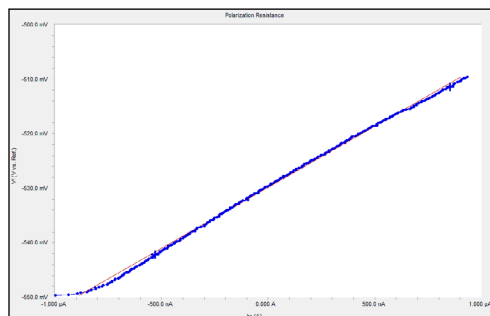
With our new Product Development Chemist, Colin Gardner, getting more established after 12 months in our laboratory, we are excited to be branching out and diving deeper into new and resurrected areas of testing MCI® products for concrete.

Resurrecting the GC-MS

Colin has gotten the Gas Chromatography-Mass Spectrometry (GC-MS) instrument back up and running after many years out of use. He is looking forward to employing this for more precise testing of things like MCI® SACI (surface applied corrosion inhibitor) migration. Up until recently, he has been using the UV-Vis Spectrometer to detect MCI® penetration depth in customer concrete samples treated with MCI® -2018, MCI®-2019, MCI®-2020, etc. While the UV-Vis can detect the MCI® component in concrete, the challenge is that plasticizers and other elements may interfere with the results, requiring a control sample to be compared alongside to distinguish the dif-



Colin with refurbished GC-MS. "I like big instruments," Colin admitted with a smile.



Example of linear polarization curve reflecting a uniform reaction rate

ference MCI® makes. With the GC-MS, Colin says detection is much more specific. The GC-MS can individually identify MCI®, plasticizer, and many other components. Now that the GC-MS is up and running, Colin is eager to use it for more precise testing of customer samples.

Electrochemical Testing

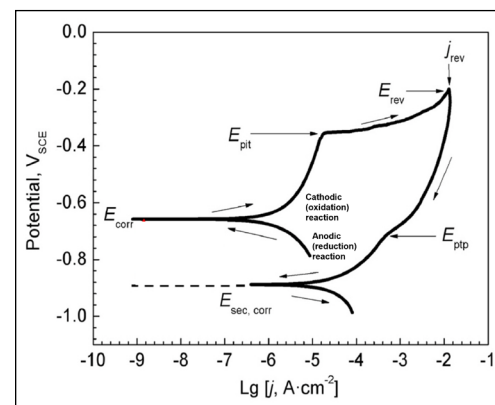
ASTM G180 has long been the standard for admixture testing but has created much dissatisfaction among laboratories running the test. The problem is that ASTM G180 uses linear polarization, which does well at measuring uniform corrosion but does not do well at measuring pitting corrosion, the type of corrosion that poses a serious problem to reinforced concrete. Pitting happens when chlorides get into the concrete and reach the level of the rebar, breaking down the natural passive layer that the highly alkaline environment has created on the steel surface. Colin explained that once a hole is created in the passive layer, the steel can corrode quite quickly.

Pitting is very random and linear polarization is therefore not well-suited to the job of studying it. Because of this, Colin is exploring the possibilities of using cyclic polarization to study pitting corrosion better and potentially come up with an improvement on ASTM G180 testing. He explained, "[C]yclic polarization is something that can look at pitting a little more directly, which we're excited about because that is the kind of corrosion we are seeing [in construction applications] . . . as opposed to the general surface corrosion, which is what G180 tests for." Ultimately, the goal is to use this testing to help develop the next generation of MCI® admixtures, as well!

Studying Admixture Set Times

Another long-term project Colin has been working on is studying MCI® admixture set times. To do

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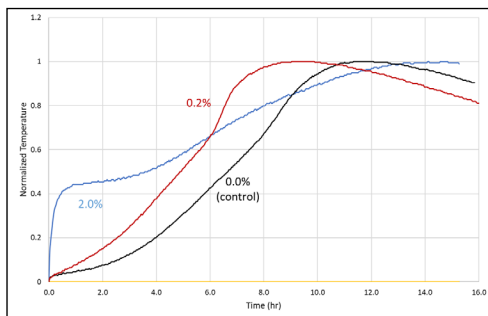
Example of cyclic polarization showing very detailed reaction information.



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so, Colin has made four calorimeters. He explained that hydration reactions which take place as the concrete sets also release heat. This heat can be measured by the calorimeter equipped with a thermal couple probe that notes temperature changes and graphs a curve that Colin can review to see initial and final set time. Knowing this data can be helpful when preparing admixtures to send out for third party



Example of concrete set time measured by calorimeter.

testing and recertification, or experimenting with possible reformulations. Colin can mix and test four new concrete/admixture



Colin has created four calorimeters to measure set time. He can test up to four samples per day.

samples per day with these calorimeters.

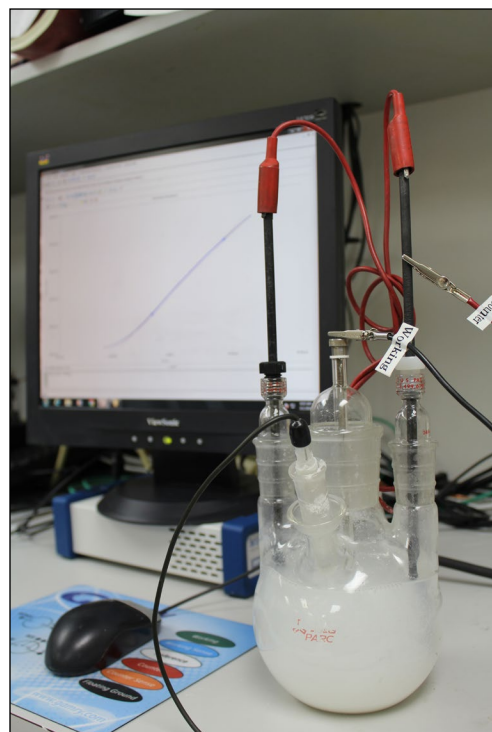
Recent Studies on MCI® for MIC

Alas, the ongoing problem of microbial induced corrosion (MIC)! Fortunately, two recent research projects are suggesting exciting possibilities for the use of MCI® in sulfate rich environments.

An independent study published in 2018 by several researchers from the King Fahd University of Petroleum & Minerals in Saudi Arabia looked at five concrete corrosion inhibitors, including one “based on amine carboxylate” (as are most MCI® admixtures). Almost all inhibitors tested showed only a marginal impact on corrosion inhibiting effectiveness when increasing exposure from 1000 ppm chloride concentration and zero sulfate to 1000 ppm chloride and 2000 ppm sulfate concentration. While amine carboxylate inhibitor efficiency dropped from 85% to 70% with the addition of sulfates at 2000 ppm, it stayed at a significantly high level to warrant use in high chloride-sulfate environments.

Although further research must be done, another whitepaper apparently forthcoming in 2023 also suggests exciting possibilities for the use of MCI® in high-sulfate environments like those with MIC problems. In particular, the chemistries used in MCI®-2005 and MCI®-2018 demonstrated a degree of protection against the deterioration of the concrete itself, not simply protection against rebar corrosion in the presence of sulfates.

Learn more about MCI® and the sulfate corrosion problem here:
<https://www.cortecmci.com/can-mci-fight-microbial-induced-corrosion-in-concrete/>

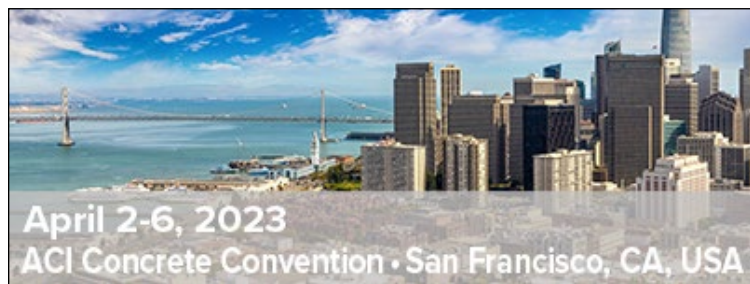




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AMPP Annual Conference 2023

March 19th- 23th, 2023
Colorado Convention Center
Denver, Colorado
Booth # 1201
<https://ace.ampp.org/home>



2023 ICRI Spring Convention

April 17th- 19th, 2023
JW Marriott Parq Vancouver
Vancouver, BC, Canada
<http://www.icri.org/>



Upcoming Events

Spring ACI Concrete Convention

April 2nd-6th
Hilton San Francisco Union Square
San Francisco, CA
<https://www.concrete.org/events/eventscalendar.aspx?m=CalendarSearchDetails&CurrentID=195941>

CONCRETE PROTECTION FROM THE SEA TO SKY

Waterproofing and Corrosion Protection

2023 ICRI SPRING CONVENTION

April 17-19 • JW Marriott Parq Vancouver • Vancouver, BC, Canada



European Sales & Strategy Meeting

October 11th-13th
Radisson Blu Hotel
Split, Croatia
https://www.cortecvci.com/whats_new/announcements/Save-the-Date-2023-Cortec-European-Sales-and-Strategy-Meeting-3.pdf

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