

AUGUST 2023

efcweb.org

LOOKING AHEAD TO THE EXCITEMENT OF EUROCORR

Dear corrosionists, Traditionally distributed during EUROCORR, the largest scientific corrosion conference in the world that covers all aspects of corrosion science and protection, this August printed issue of the EFC Newsletter celebrates all things EUROCORR. The local organising team of Veerle Fincken, Marjorie Olivier, and Herman Terryn have done a great job and we are all looking forward to the intense and exciting days ahead in Brussels.

As usual, it will be very difficult to choose between the wide range of plenaries, sessions, talks, and business meetings, as the programme is simply bursting with content. And indeed, nobody wants to miss the opportunity to meet their peers and friends, and learn about new products presented by exhibitors. And all this in only four days; what a hard job in front of us!

Thanks to you, the active participants in EUROCORR, and the intense work of members of the Science and Technology Advisory Committee (STAC) and Working Parties, each session offers a rich scientific and technical programme. I do not have space here to discuss all of the sessions, even though I would like to, so let me highlight only one, the joint session on Hydrogen and Metallic Materials.

A lot has been said about the hydrogen economy in recent years, often by politicians who have only a vague understanding of what exactly is behind this idea. However, most aspects of the hydrogen economy involve the interaction of hydrogen with metallic materials and

their eventual accelerated degradation, which is still not sufficiently understood. Therefore, four EFC Working Parties, a Task Force, and the World Corrosion Organization joined forces and gathered talks related to the hydrogen-metal interaction into a single joint session. The goal of the co-operation is to bring together academia and industry to create a platform for the exchange of knowledge and ideas on material aspects of the production, transport, storage, and use of hydrogen.

Obviously, experts in electrolysis, energy transition, automotive high-strength steels, aluminium alloys for aerospace applications, as well as the oil and gas sector can learn immensely from each other. I am happy to announce that this joint session attracted a large number of presenters and will run for four days.

I also want to draw your attention to the business meetings of the Working Parties, where their activities are presented and discussed, and where any EUROCORR participant is welcome. Please note that this year all Working Party Chairs and Vice-Chairs will also be elected at these meetings for the next three-year term. You automatically have a voting right and members of an EFC Member Society can even consider their candidacy for the Chair or Vice-Chair position. More information about the EFC Working Parties and their mission can be found in this issue on page 12.

I hope you enjoy EUROCORR 2023!

Yours,
Tomáš Prošek, EFC President



INSIDE YOUR LATEST EFC NEWSLETTER

[2. WELCOME TO EUROCORR 2023](#)

All you need to know about this year's event in Brussels

[6. EUROPEAN CORROSION MEDAL](#)

Dr Michael Rohwerder is given the prestigious honour

[8. YOUNG EFC'S FULL CALENDAR](#)

Presentations, awards, and EUROCORR fill YEFC's diary

[10. EFC HONORARY FELLOWS ANNOUNCED](#)

Steve Paterson and Wolfram Furbeth will be honoured at EUROCORR in Brussels

[12. WORKING PARTIES AT EUROCORR](#)

Your guide to when and where each WP will present

[16. EFC GREEN BOOKS SERIES CONTINUES](#)

The series is the ultimate resource for any corrosionist

[18. INTRODUCING THE NICEFFECT PROJECT](#)

Unlocking the potential of Ni-based materials

[29. EFC EVENTS](#)

Make a date in your corrosion calendar for future EFC events

WELCOME TO EUROCORR 2023 IN BRUSSELS

The EUROCORR 2023 local organising committee explain the details and decisions that have gone into planning this year's event



From left, meet the team: Katrien Van Hecke, Vrije Universiteit Brussel (VUB), Belgium; Prof. Dr Ir Marjorie Olivier, Université de Mons (UMONS), Belgium; Prof. Dr Ir Herman Terry, Vrije Universiteit Brussel (VUB), Belgium; Petra Zavodna, GUARANT International, Czech Republic; Ir Veerle Fincken, VOM, Leuven, Belgium

WHAT DROVE YOUR DECISION MAKING PROCESS IN SELECTING THE PLENARY SPEAKERS FOR EUROCORR 2023?

Prof. Dr Ir Marjorie Olivier, Université de Mons (UMONS), Prof. Dr Ir Herman Terry, Vrije Universiteit Brussel (VUB), Prof. Dr Ir Iris De Graeve, Vrije Universiteit Brussel (VUB):

→ The plenary speakers have been selected based on the quality of their scientific careers and their international reputation in the field of corrosion. Travelling from three different continents, they come from academia, industry, and a variety of European bodies. From academia, Sviatlana Lamaka (Hereon-Germany) will focus on research related to local electrochemical measurements. Dawei Zhang (USTB-China) will bring us into the world of data-driven intelligent technologies for corrosion prediction and control. From the industrial point of view, Niamh Hosking (Ford-USA) will provide an overview of corrosion perspectives from the automotive industry, including e-cars, while Sofie Norager (DG Research-Innovation-Belgium) will bring safe and sustainable by design chemicals and materials in relation to the industrial transition programme.

HOW DO YOU SUPPORT THE YOUNG EFC AND HOW HAVE YOU IMPLEMENTED CHANGES IN THE PROGRAMME?

Prof. Dr Ir Marjorie Olivier, Université de Mons (UMONS), Prof. Dr Ir Herman Terry, Vrije Universiteit Brussel (VUB):

→ The younger generation of researchers (YEFC) will be given pride of place at EUROCORR 2023, with the organisation of a Summer School in the days leading up to the conference, a plenary lecture by one of their members, as well as prizes awarded for the best poster and the best oral presentations. Posters and the programme will be available on an interactive app, enabling you to organise special meetings and personalise your diary.

This year's programme will focus on the use, storage, and production of hydrogen in conjunction with the choice of materials during a full session of four days. The need to monitor corrosion using sensors and the importance of studying corrosion phenomena in the development of parts obtained by additive manufacturing will also be the subject of a specific session.

Ir Veerle Fincken, VOM:

→ As a representative of the Belgian surface finishing industry, VOM considers it very important that science and industry are connected. The Green Deal, more specifically the sustainable use of raw materials, the resolution of energy challenges, and increasingly strict regulations from Europe are the drivers for research and innovation.

The topics covered by EUROCORR are more important than ever for the industry to be prepared for a bright future. For this reason, the local organising committee is making an extra effort to encourage Belgian companies to participate in EUROCORR through the Belgian Pavilion and targeted marketing campaigns.

WHAT ARE YOU MOST LOOKING FORWARD TO DURING EUROCORR 2023?

Ir Veerle Fincken, VOM:

→ Three years later than planned, because the COVID pandemic put the world on hold in 2020, the Belgian team welcomes nearly 1,000 corrosionists from all over the world to the beating heart of Belgium. Anno 2023, we are ready as a strong team to make it an unforgettable event for all participants in Brussels.

We are happy to launch a range of new initiatives that are much appreciated by the younger generation. The rejuvenation has started. They are paving the way for the future of EUROCORR.

HOW DO YOU INCORPORATE SUSTAINABILITY INITIATIVES INTO EUROCORR 2023 TO HELP PROMOTE ENVIRONMENTAL RESPONSIBILITY?

Ir Veerle Fincken, VOM:

→ It's all about sustainability. Even on the conference floor. A digital app will allow participants to easily navigate through the programme and create their own personal agenda on their smartphones (scan the QR code to find out more). In addition, there are the e-posters. In terms of food and beverages, water fountains, and recycled cups will be available on each floor of the conference. Each participant will receive their personal water bottle during the congress and it was decided to replace the lunch box with buffets to help minimise packaging waste.



THE WELCOME DRINK WILL TAKE PLACE IN THE MAGRITTE FOYER, WHICH FEATURES AN ORIGINAL FRESCO BY RENÉ MAGRITTE. WOULD YOU LIKE TO SHARE ANY INFORMATION ABOUT THE PAINTING WITH EUROCORR 2023 PARTICIPANTS?

Prof. Dr Ir Herman Terryn, Vrije Universiteit Brussel (VUB):

→ Environmental factors are crucial for long-term exposure to complex paint layers on building materials. The small paper patches on the surface of the mural by Paul Delvaux (1959), decorating the entrance of the Congress Centre Square (the former Palais des Congrès from 1955 to 1958), temporarily protect the paint layer from flaking. A recurring problem of water infiltration into the building materials has been haunting this work of art almost since its creation and has led to several subsequent restorations. The painting by René Magritte on a dry substrate has significantly fewer conservation issues.

WHAT CAN THE PARTICIPANTS LOOK FORWARD TO AT THE CONGRESS DINNER?

Prof. Dr Ir Herman Terryn, Vrije Universiteit Brussel (VUB):

→ To bring us completely into the sphere of technology of materials, the congress dinner will be organised at Autoworld. Participants will have dinner and even the possibility to dance surrounded by historically iconic cars.

MEET THE PLENARY SPEAKERS



→ **SOFIE NØRAGER, BELGIUM**
Safe and Sustainable by Design
Chemicals & Materials

Sofie is currently the Deputy Head of the Industrial Transformation of DG Research and Innovation unit at the European Commission

→ **DAWEI ZHANG, CHINA**
Data-driven intelligent
technologies for corrosion
prediction and control

Dawei is Deputy Director of the National Materials Corrosion and Protection Data Center



→ **NIAMH HOSKING, USA**
Real-World Applications of
Corrosion Science: Perspectives
from the Automotive Industry

Niamh is a Research Engineer at Ford Motor Company who specialises in corrosion protection for automotive materials

→ **SVIATLANA LAMAKA, GERMANY**
Light alloys: unravelling mechanisms
for degradation control

Sviatlana is Head of the Department of Electrochemistry and Big-Data at the Institute of Surface Science of Helmholtz Zentrum Hereon, Germany



YOUR EUROCORR 2023 HOSTS



ALL YOU NEED TO KNOW ABOUT EUROCORR 2023

Stay up to date with all EUROCORR 2023 events with our congress programme

CONGRESS PROGRAMME

- Corrosion and Scale Inhibition (WP1)
- Corrosion by Hot Gases and Combustion Products (WP3)
- Nuclear Corrosion (WP4)
- Environment Sensitive Fracture (WP5)
- Corrosion Mechanisms, Electrochemical Methods in Corrosion Research and Modelling of Corrosion Processes (WP6 and WP8)
- Corrosion Education (WP7)
- Marine Corrosion (WP9)
- Microbial Corrosion (WP10)
- Corrosion of Steel in Concrete (WP11)
- Corrosion in Oil and Gas Production (WP13)
- Coatings (WP14)
- Corrosion in Refinery and Petrochemistry (WP15)
- Cathodic Protection (WP16)
- Automotive Corrosion (WP17)
- Tribo-Corrosion (WP18)
- Corrosion of Polymer Materials (WP19)
- Corrosion and Corrosion Protection of Drinking Water Systems (WP20)
- Corrosion of Archaeological and Historical Artefacts (WP21)
- Corrosion Control in Aerospace (WP22)
- Corrosion Reliability of Electronics (WP23)
- CO₂ - Corrosion in Industrial Applications (WP24)
- Atmospheric Corrosion (WP25)
- Medical Implants and Devices (TF)
- Corrosion of Green & Low Carbon Energy Technologies (TF Green)

JOINT SESSIONS

- HALL 2** → JS 6 Hydrogen and Metallic Materials (WP5, WP17, WP22, WP25, TF, WCO) **(28-31 August)**
- HALL 3** → Mechanisms, Methods & Modelling **(28-31 August)**
- HALL 4** → Atmospheric Corrosion **(28-30 August)**, JS 15 Corrosion Issues of Electric Vehicles (WP17, WP23) (29 August), Automotive Corrosion **(29-30 August)**, JS 16 Multiscale Modelling for Design of Protective Coatings (WP6, WP8, WP14, WP22, WP25) **(30-31 August)**
- HALL 5** → Organic Coatings **(28-29 August)**, Metallic Coatings (29 August), Self-Healing Coatings **(30 August)**, Inorganic Coatings **(31 August)**
- HALL 6** → Nuclear Corrosion **(28-30 August)**, Corrosion and Scale Inhibition **(30-31 August)**
- HALL 7** → Microbial Corrosion **(28-29 August)**, Corrosion of Steel in Concrete **(29-31 August)**
- HALL 8** → WS 1 Corrosion in Chemical Process Industries

(29 August), Corrosion Education **(29 August)**, Corrosion in Oil & Gas Production **(29-31 August)**

HALL 9 → JS 7 Corrosion Sensing, Monitoring and Prediction (WP6, WP8, WP25) **(28-29 August)**, Mechanisms, Methods & Modelling **(29-30 August)**, Pretreatments (30 August), JS 13 Polymers in Organic Coatings (WP14, WP 19) **(31 August)**

HALL 10 → Corrosion in the Refinery Industry **(28 August)** CO₂-Corrosion in Industrial Applications **(29 August)**, Green & Low Carbon TF (30 August), JS 14 Corrosion in Green and Low Carbon Technologies (WP15, TF) **(31 August)**, JS 17 Low Carbon and Green Energy on CO₂ – Corrosion in Underground Facilities (WP13, WP24, TF) **(31 August)**

HALL 11 → Reliability of Electronic Devices **(28 August)**, JS 15 Corrosion Issues of Electric Vehicles (WP17, WP23) **(29 August)**, Environment Sensitive Fracture **(29 August)**, JS 5 Environmentally-Assisted Crack Initiation (WP4, WP5, WP22) **(29 August)**, JS 8 Microbial Corrosion in Marine Environment (WP9, WP10) **(30 August)**, JS 9 Cathodic Protection in Marine Environment (WP9, WP16) **(30 August)**, Marine Corrosion **(30-31 August)**

HALL 12 → Corrosion by Hot Gases **(28-29 August)**, JS 4 Coatings for High Temperature (WP3, WP14) **(29 August)**, WS 1 Additive Manufactured Metals **(29-30 August)**, Cathodic Protection **(31 August)**

HALL 13 → JS 9 Cathodic Protection in Marine Environment (WP 9, WP 16) **(28 August)**, WS 2 Biomedical Applications **(29 August)**, Corrosion of Medical Implants and Devices **(29 August)**, Tribocorrosion **(30 August)**, Metallic Coatings **(31 August)**

HALL 14 → Corrosion in Aerospace **(28 August)**, JS 12 Cathodic Protection of Steel in Concrete (WP11, WP 16) **(29 August)**, Drinking Water **(29 August)**, Automotive Corrosion **(30 August)**, Archaeological and Historical Artefacts **(31 August)**

CONGRESS SECRETARIAT CONTACT

GUARANT International, Ceskomoravska 2510/19,
190 00 Prague 9, Czech Republic
Phone: +420 284 001 444,
Web: eurocorr2023@guarant.cz, guarant.cz

HOSTED BY

VOM asbl, Kapeldreef 60, BE-3001 Leuven
Phone: +32 (0)16 40 14 20
Web: info@vom.be, vom.be
EUROCORR2023.ORG

CEFRACOR INVITES YOU TO PARIS FOR EUROCORR 2024

The Palais des Congrès de Paris will host the event and EUROCORR 2024 Chair, Philippe Marcus, is looking forward to seeing you there



In 2024 EUROCORR will take place in Paris, France, from 1 to 5 September 2024. The venue is the Palais des Congrès de Paris, which is ideally located within walking distance from the Avenue des Champs-Élysées, a major Paris landmark, and easily accessible by public transport.

Paris is one of the world's leading tourist destinations and in 2024 will host the Olympic and Paralympic Games. There is always something new to discover in this spectacular city packed with famous attractions, museums, restaurants, and many fascinating historic and modern neighbourhoods to explore.

After the success of EUROCORR in Nice in 2004 and 2009, and Montpellier in 2016, CEFRACOR, a member Society of the EFC, in co-operation with Chimie ParisTech, has been selected by the EFC to organise this major event. EUROCORR 2024 will cover all aspects of corrosion science, technology, and engineering, with an emphasis on a main theme: A step forward in societal awareness of material degradation issues.

This will be achieved by bringing together corrosion experts from universities, research centres, and industry. EUROCORR 2024 will provide a forum for presentation and discussion of advances in understanding corrosion phenomena and progress in corrosion prevention.

The programme will include plenary lectures, keynote lectures, oral and poster presentations in all the areas covered by the EFC Working Parties, with additional topical workshops. A preview of the topics is given to the right.

A large exhibition is planned, which will feature the latest developments in corrosion resistant materials, corrosion research, corrosion monitoring, coatings, inhibitors, cathodic protection. Social events, including receptions and a conference dinner, will contribute to the exciting and festive atmosphere that you will find in Paris. We are looking forward to welcoming you in Paris for EUROCORR 2024. Please save the date!

Philippe Marcus (pictured),
Chair of EUROCORR 2024



TOPICS FOR EUROCORR 2024

- Corrosion and Scale Inhibition (WP1)
- Corrosion by Hot Gases and Combustion Products (WP3)
- Nuclear Corrosion (WP4)
- Environment Sensitive Fracture (WP5)
- Corrosion Mechanisms, Methods and Modelling (WP6 & WP8)
- Corrosion Education (WP7)
- Marine Corrosion (WP9)
- Microbial Corrosion (WP10)
- Corrosion of Steel in Concrete (WP11)
- Corrosion in Oil & Gas Production (WP13)
- Coatings (WP14)
- Corrosion in the Refinery and Petrochemistry Industry (WP15)
- Cathodic Protection (WP16)
- Automotive Corrosion (WP17)
- Tribocorrosion (WP18)
- Polymers and Advanced Materials (WP19)
- Corrosion & Corrosion Protection of Drinking Water Systems (WP20)
- Corrosion of Archaeological and Historical Artefacts (WP21)
- Corrosion Control in Aerospace (WP22)
- Corrosion Reliability of Electronics (WP23)
- CO₂-Corrosion in Industrial Applications (WP24)
- Atmospheric Corrosion (WP25)
- Corrosion of Medical Implants and Devices (TF)
- Corrosion in Green & Low Carbon Energy Technologies (TF Green)

TOPICS FOR JOINT SESSIONS AND WORKSHOPS

- Transition to hydrogen-based energy systems
- Corrosion and corrosion protection issues in additive manufacturing
- Design and performance of corrosion resistant high entropy alloys and multi-principal element alloys
- Certification in corrosion and corrosion protection

IMPORTANT DEADLINES

- Submission of abstracts: **15 January 2024**
- Notification of acceptance to authors: **29 April 2024**
- Reduced fee for early registration: **7 June 2024**

CONTACT

CEFRACOR, 28 rue Saint-Dominique, 75007 Paris, France
Phone: +33 (0)1 47 05 39 26
Web: eurocorr2024@cefracor.org, www.eurocorr2024.org



"CORROSION AND ELECTROCHEMISTRY ARE KEY TO SOLVE THE PROBLEMS OF THE FUTURE"



For nearly 25 years, Dr Michael Rohwerder, has addressed the fundamental questions of corrosion science - and he's not resting on his laurels after being awarded the prestigious European Corrosion Medal

With an impressive list of accolades and achievements that includes nearly 25 years at the Max-Planck-Institut, the award of a laboratory from the Christian Doppler Society, and the publication of more than 200 peer-reviewed papers, some might be forgiven for taking their foot off the gas, but not this year's recipient of the EFC's European Corrosion Medal, Dr Michael Rohwerder, who has an infectious enthusiasm for the future.

The award of the European Corrosion Medal for 2023 recognises Dr Rohwerder's exceptional research that has greatly contributed to the understanding of fundamental corrosion mechanisms, while his understanding of organic and metallic coating failures and degradation has ensured he is widely recognised by all in academia and industry for his contributions to the development to sustainable ideas in organic coatings. And, there's more to come

"Organic coatings are still fascinating, but I think not all is solved," explained Dr Rohwerder, who has been the Group Leader of Corrosion, Department Interface Chemistry and Surface Engineering at the Max-Planck-Institut für Eisenforschung GmbH in Düsseldorf, Germany, since 2000. "For example, we have understood now very fundamental processes of corrosion driven coating delamination, but we are still lacking information needed for reliable computer simulated modelling. There are still aspects missing. It's of course because coatings are complex, especially the interface is still not well enough investigated. How does it really look like on the molecular and nanoscopic scale?"

"It's difficult to characterize, but there are so many things to do still. And I think it's important that we go further and try to build on the midterm scale so that we are able to do computer-based simulation of corrosion phenomena."

Many questions remain for Dr Rohwerder and it's this curiosity in corrosion science, and science as a whole, that's driven him to become a well-respected figure within the corrosion community who hosts lectures at leading

conferences in electrochemistry and corrosion science, and has been a key contributor in industry projects. And, like so much that Dr Rohwerder undertakes, enthusiasm is at the heart of his approach to corrosion science. It's infectious. His enthusiasm reflects a career following a passion and a determination to make a difference in a changing society.

MODERN CHALLENGES

"I'm somebody who wants to know that the research I'm doing is of use. We are currently facing many problems as a society as we try to move away from CO₂ and go towards more sustainability in general. Preventing corrosion or at least elongating the lifetime of goods and infrastructure is a huge factor in this context. And we see many corrosion related problems in technologies for green energy production, such as electrolyses. Solving them is key to making the transition a success."

This curiosity stems from a fascination with science that dates back to a long-held curiosity of physics and a desire to gain a deep understanding of his drive to make a difference in society. And now with the award of the European Corrosion Medal, which he will be presented with at EUROCORN in Brussels, Dr Rohwerder has another platform to not only share his decades of experience, but his enthusiasm too.

"I think one can say that this recognition strengthens my position when applying for research funding and grants. Funding agencies often prioritize individuals with a proven track record of excellence, and winning the European Corrosion Medal certainly bolsters my chances of securing financial support for future research endeavours.

"The enhanced visibility coming with the medal also provides a gateway to connect with leading experts, researchers, and industry professionals in the field of corrosion science who are specialized in other topics than I am. They might say 'what he's doing is interesting for us too!' That may lead to new collaborations and new synergies."

For Dr Rohwerder, this fascination developed from a young age and lit a fire of interest for the future corrosion scientist, who remains fascinated by the possibilities of science.

"I can't remember why exactly I studied physics. It was not for a single reason, but I know one reason was that I wanted to understand things from the basics. That now sounds a little spiritual," jokes Dr Rohwerder, as he pauses to reflect. "This was the era of New Age and I wanted to understand things at the deepest level. So, I studied physics and when I graduated I looked for something to further myself in science.

"And then, I got accepted as a PhD student at the Max-Planck-Institut. There I started to focus on corrosion science and found it very, very interesting. After my dissertation, I held a postdoc at the University of Austin, USA to deepen my knowledge in electrochemistry, where I joined a renowned electrochemistry group headed by Professor A.J. Bard. He wrote some of the standard textbooks for electrochemistry and was working at the very frontiers of that research field, so it was an interesting time. After that I joined Prof. M. Stratmann at the University of Erlangen (Germany) to build up a high temperature oxidation group, which was another change of focus."

"Then I went back with him to the Max-Planck-Institut and helped establish the Department of Interface Chemistry and Surface Engineering. I learned many aspects of corrosion, electrochemistry, surface treatments, and more. It was very inspiring and it still is! I've continued working on many of these research topics and now I have to decide where to draw my attention. Corrosion science is so broad now and all of the topics are so important. Certainly, one topic will be hydrogen and its interaction with materials. We have developed a highly sensitive technique with high spatial resolution for detecting hydrogen that might play a

crucial role in unravelling detrimental effects of hydrogen, such as hydrogen embrittlement of high-strength alloys, but may also be helpful in investigating effects related to the storage and transport of hydrogen, for example."

Corrosion science is clearly a deeply held passion for Dr Rohwerder that hasn't faded. Instead, this desire to make a change to society through the advancement of corrosion science has only grown over time. And, after two decades his position within the corrosion community is one of a well respected figure. His research provides inspiration for many, especially young corrosionists. It's his enthusiasm that really comes across though, which can only add to any prospective corrosion scientist's interest. This isn't to say that Dr Rohwerder is single minded in his support for organic and metallic coatings, for example, as he believes there are still many challenges facing corrosion science. And perhaps unusually for a scientist who has built an career on qualitative research, he recommends that the next wave of scientists to follow their heart.

"If you're interested in technology, if you're interested in achieving something, then science is a great field. And corrosion and electrochemistry, I would say, are key disciplines to solve the problems of the future related to transforming our economies and reducing CO₂ output to help create a more sustainable future.

"We have to succeed now and make a transformation or we fail to make an impact on society as corrosion scientists. That is of course scary, but it also means there are a lot of things to do. And, if you're an optimistic person and we do our best, then hopefully we succeed together. So, whether it's applied or fundamental, whether it's electrochemistry or corrosion, I think they should do what they have a passion for as they will find some interesting questions, for sure. And they will not have to worry about finding a good position."

WHAT IS THE EUROPEAN CORROSION MEDAL?

The European Corrosion Medal recognises achievements by a scientist in the application of corrosion science. The annual award consists of a bronze medal, diploma, and a €1,000 prize. The ceremony will take place at the EUROCORR 2023 opening session on Monday 28 August, prior to Dr Rohwerder's Plenary Lecture titled, ***Sustaining Tomorrow: The Crucial Role of Corrosion***

The Max-Planck-Institut für Eisenforschung (right) in Düsseldorf, Germany where Dr Michael Rohwerder has addressed the fundamental questions of corrosion science since 2000 as the Group Leader of Corrosion, Department of Interface Chemistry and Surface Engineering



INVESTING IN THE FUTURE WITH YEFC



From arranging events at EUROCORR, to creating initiatives, and supporting many activities, the Young EFC (YEFC) have had a busy few months. Open your phone camera over the QR codes to read more

VIACHESLAV SHKIRSKIY
FRANCE

Unsupervised Discovery
of Corrosion Mechanisms
by Optical Microscopies

EUROCORR
AUGUST 27-31, 2023
THE ANNUAL CONGRESS OF THE EUROPEAN
FEDERATION OF CORROSION
BELGIUM BRUSSELS

**FIND YEFC
IN THE ARC
@EUROCORR**

WWW.EUROCORR2023.ORG

Viacheslav (Slava) Shkirskiy (ITODYS, Université Paris Cité, France) has been selected as YEFC Plenarist at EUROCORR 2023 by a jury of YEFC board members and seven external jury members based on a three minute video presentation about his research.

A 3M Plenary Lecture Competition for early career researchers was organised to select the YEFC Plenarist. After a first screening based on a one minute video, CV, and motivation letter, three participants were selected for the second and last round, but Slava was chosen as the overall winner of the 3M Plenary Lecture Competition.

Slava Shkirskiy (pictured) currently works in the ITODYS laboratory at Université Paris Cité. His plenary lecture, *Unsupervised Discovery of Corrosion Mechanisms by Optical Microscopies* will take place on the morning of Wednesday 30 August.

BEST ORAL PRESENTATION AWARDS

Two oral presentation prizes that recognise the outstanding communication skills of early career corrosionists will be awarded during EUROCORR 2023. A preselection of (maximum) 10 candidates will take place prior to the event in Brussels

based on a three minute (3M) video. The awards for the best oral presentations will be donated by the Materials Institute of UMONS (Belgium). Details about eligibility and application process can be found here:

Finalists informed: **14 August 2023**
Awardees announced: **31 August 2023**



YEFC AT EUROCORR

The 9th annual meeting of the Young EFC will take place during EUROCORR2023 on Tuesday 29 August at 18.00 in The Arc (Square, Brussels Meeting Center).

ONLINE EFC CAREER WEBINAR

The online EFC career webinar has this year turned towards industrial career pathways and on 17 March, Elizabeth Szala (Aluminum Duffel, Belgium) and Carolina Schneiker (RISE, Sweden) delivered an inspiring interactive session on their career paths and the future of automotive corrosion.

This was followed by a webinar from Peter Visser (AkzoNobel, Netherlands) on 7 June about his career path in the field of corrosion protection and his passion for paint. You can watch again on the YEFC YouTube channel.



young EFC
EUROPEAN FEDERATION OF CORROSION

ANNUAL MEETING
AT EUROCORR 2023

Venue: The Arc (Square, Brussels Meeting Center)
On **August 29th at 18:00**

Save the date and join our get together!

JOIN YEFC →

THE YEFC SCIENCE COMMUNICATION INITIATIVE GETS UNDER WAY WITH POSTER PRESENTATION

The Young EFC are thrilled to announce the launch the YEFC Science Communication Initiative on 6 April when Mike Morrison introduced and discussed new ways to design and master scientific poster.

This was followed on 12 May and 15 June by two online professional workshops on *The Art of Impactful Science Communication* with Barry Fitzgerald. In the first webinar, Fitzgerald, who hosts the podcast *BingeWatch Academy: Superhero Science* and is the editor-in-chief of the Open Access journal, *Superhero Science and Technology*, introduced tips and tricks to better communicate about work on different stages.

PITCH PRESENTATIONS

The second event focused on pitch presentations and in particular three minute presentations. The event was limited to a small number of participants to favour close

interaction and personalised feedback during the workshops, which were sponsored by Metrohm Schweiz AG and Anton Paar TriTec SA.

The last event of the season on 29 June saw Andrew Akbashev discuss various strategies to make an impact on professional communities through social media in the workshop *Social Media for Academia and Professional Growth*. The take home message was not post for the sake of posting, but instead to develop your own vision, ideas, and perspectives. All events were met very positively by the early career corrosionist community. Science communication recordings and resources can be found on the YEFC website.



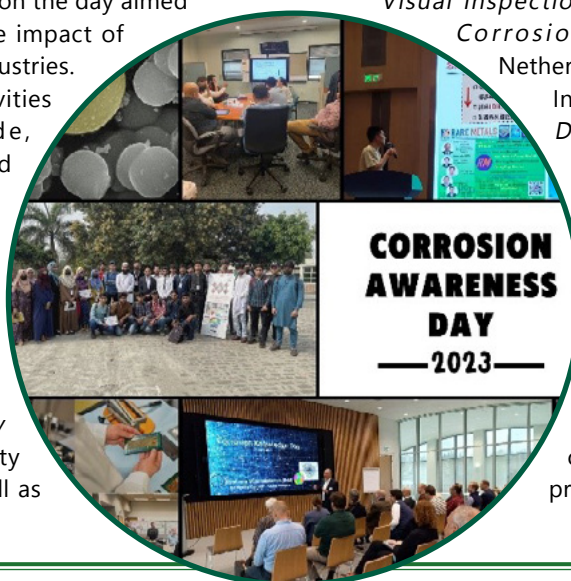
SUPPORTING THE WCO ON CORROSION AWARENESS DAY WITH 20 GLOBAL ACTIVITIES

The World Corrosion Organization's (WCO) Corrosion Awareness Day took place on 24 April and the YEFC supported a range of activities on the day aimed at raising awareness about the impact of corrosion in our society and industries.

This year more than 20 activities were organised worldwide, including corrosion-themed photo competitions organised at Corrosion@Manchester (University of Manchester, UK) and at Max-Planck-Institute for Iron Research (Germany). There were lectures, like *Building TRUST against RUST* at NITK (India) and *Chemistry Behind Corrosion* at the University of the Punjab (Pakistan), as well as

workshops on the basics of corrosion testing (Saudi Aramco Research & Development Center, Saudi Arabia) and *Beyond Visual Inspection: The Power of Electrochemical Corrosion Testing* (Metrohm Autolab, Netherlands).

In addition, there were seminars on *Discussing Data-Driven Analysis of Pitting Corrosion* at SURF (VUB, Belgium), Swiss Corrosion Science Day 2023 (Switzerland), and the fourth online seminar on nuclear corrosion (Switzerland). A list of all these activities can be found on the YEFC website. The YEFC would like to thank the WCO for helping the dissemination of corrosion in our society and promoting the visibility of our research.



The YEFC board consists of **Claudia Martinez** (CorrosionRADAR, UK), **Marta Mohedano** (Universidad Complutense de Madrid, Spain), **Noémie Ott** (OST, Switzerland), **Can Özkan** (Delft University of Technology, Netherlands) and **Andressa Trentin** (VTT, Finland). We benefit from the support of **Maryna Taryba** (Technical University of Lisbon, Portugal) with the YEFC-Elsevier webinar series and we are so grateful to **Leonardo B. Coelho** (VUB, Belgium) and **Aytac Yilmaz** (Ore Energy, Netherlands) for their engagement over the years and wish them good luck in their future corrosion endeavours.

ESTEEMED CORROSIONISTS MADE HONORARY FELLOWS

Given for outstanding accomplishment in corrosion science, Steve Paterson and Wolfram Fürbeth explain what becoming an EFC Honorary Fellow means to them

28 AUG,
9.15, HALL 1
@EUROCORR

Active in the field of electrolytic corrosion and corrosion protection by coatings for the majority of his career, Professor Wolfram Fürbeth has devoted himself to developing innovative corrosion protection solutions for materials and process issues in industry by covering gaps in fundamental understanding and applied industrial challenges.

This is underlined by the number of peer-reviewed papers, technical reports, patents, and books he has published. Besides being an exceptional scientist, Professor Fürbeth (pictured) co-organised EUROCORR 2022 in Berlin, as well as AETOC2017 in Billerbeck, Germany. Both events proved to be a tremendous success from a scientific point of view and for the EFC.

An active supporter of the EFC for more than 10 years, Professor Fürbeth is an asset to the Foundation's members and the corrosion community. He is currently Head Electrolytic Corrosion and DECHEMA Corrosion Center at DECHEMA Research Institute, Frankfurt am Main, as well as Chair of Working Party 14 on Coatings, which has the greatest number of



participants within an EFC Working Party, along with the greatest diversity of technologies and activities. For six years, he served as a STAC Chair and led the Committee through one of the most challenging times Europe has faced in recent decades, while establishing new formats like the Virtual EUROCORR. He also served as Chair of the Committee for EFC Medal Award until 2022 and since 2011 has been a member of the EUROCORR International Scientific Committee.

An exceptional researcher in different fields of corrosion research and technology, Prof Wolfram Fürbeth is very active and the focus of his research has included corrosion protection through novel coatings on metals, nanoparticulate coating systems, oxide layer modification, and microbially influenced corrosion and corrosion protection by biopolymers.

Professor Fürbeth has always managed to build a strong scientific and technical foundation, which is essential for the success of EFC. And from a scientific point of view, the EFC would not be as successful as it is today without the endless work and enthusiastic spirit of Professor Wolfram Fürbeth.

"IT'S NOT JUST ABOUT GIVING SOMETHING, BUT ALSO ABOUT RECEIVING QUITE A LOT"

To receive this Honorary Fellowship is a great honour for me. It reflects my long-term engagement in the European Federation of Corrosion and can therefore be seen as some kind of thank you.

However, although serving the community has been an essential part of my life since my youth in a scouting organisation, it has always been much more than just service. Any engagement has let me learn a lot, gain more experience, meet new friends, and last but not least have a lot of pleasure and many nice moments. So, it is not just about giving something, but also about receiving back quite a lot!

To me, EFC has always been some kind of European corrosion family, with EUROCORR as its annual family meeting. So, I can only recommend young corrosionists to become a part of this family, at least by attending

EUROCORR, or even by engaging yourself. With the creation of the Young EFC in recent years we have established a very good entrance to this family and our corrosion community.

Looking back to my term as STAC chair I am particularly proud of the growth of EFC's scientific activities in very important fields like atmospheric corrosion, green energy technologies, as well as biomedical implants. As a WP chair and STAC member I will still try to support this growth into new fields.

However, my future engagement has now shifted more to the national frame having been elected as the new president of the German corrosion society GfKORR with the beginning of this year. Anyway being this a strong member society I will still do my best to support EFC also from this side.

"THE DIVERSITY OF IDEAS IS SO IMPORTANT"

It's so important to pass on knowledge and skills. And one thing I'm very keen on is to not necessarily indoctrinate, but create the knowledge for younger people to use in the way that they want to. And if they want to do things differently, then that's good too.

My problem is I have difficulty saying no, particularly when it involves exciting things, and particularly when it involves teaching and passing on knowledge. I have to start saying no. I attended the summer school last year in Berlin and gave a presentation on low carbon and green energies. It was such an inspiring bunch of young scientists and engineers that were very motivating for me. You could pick up the energy in the room immediately. It's a very worthwhile exercise, but also a very rewarding thing to get involved in. We are planning the Task Force to run a summer school next year in Paris. So we're already putting together a programme for that.

But for me, the EUROCORR conference is the pinnacle and what I really like about it is that it moves from country to country. That allows you to travel to new places, meet new people, experience the local culture, and really engage in a lot of great scientific discussion in a relaxed environment. For me, the EUROCORR conferences are something that I look forward to. And also hearing where the next one's going to be!

We've got a good session planned this year on corrosion in low carbon and green energy technologies. There's also a joint one on biofuels, and a joint session

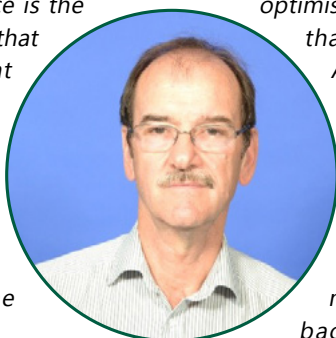
on carbon capture and storage (ccs). But what I'm really excited about is the sort of joint session we put together with the WPs in environment sensitive fracture, automotive, atmospheric that's on hydrogen. We've got this session that will run through the full four days. And I'm excited about that. Christine Blanc and Elizabeth Sala have been really instrumental in putting together a fantastic programme.

I'm also involved with the Institute of Corrosion, Aberdeen branch and I've been involved in the Young Engineers programme. It's all very well doing stuff in country, but I think it's so important to have that collaboration across borders, because you learn so much and other people have different ways, different ideas, different cultures, which influence ideas as well.

I'm quite a forward facing and don't tend to ponder. I tend to look forward, not back. I guess I'm naturally optimistic and I tend to look forward. Having said that, when I was a team leader in Shell in Aberdeen, I really encouraged the whole idea of having regular reflective sessions.

I've talked a lot about young people and creating opportunities, but it's about creating opportunities for all. And it's about diversity in all senses. It's not just gender, but diversity of ideas too and moving forward with EFC. And to go way back to the start of my career, I had an

*inspirational boss in my early days. He put it very simply, and I'm not sure if you could publish this, but he said quite simply, don't **** on ideas.*



A DEVOTION TO DEVELOPING THE SCIENCE OF CORROSION EARNS DR PATERSON FELLOWSHIP

Dr Steve Paterson has made significant contributions to the EFC since 1997, including the EFC Position Paper on *Corrosion Challenges Towards a Sustainable Society*, the collaboration with China to organise the International Conference on Corrosion Protection and Application in 2022, as well as his participation in the EFC Summer School in 2022 and his contribution to a joint session with other EFC Working Parties on hydrogen at EUROCORR 2021.

He has also chaired the EFC Working Party 13 on Corrosion in the Oil and Gas Industry from 2013 to 2017 and has been Chair of the EFC Task Force on Corrosion in Green and Low Carbon Energy Technologies since its inception in 2020. Dr Paterson's contribution to corrosion science is well established. His involvement with the Institute of Corrosion in the UK, as well as his contribution to the EFC and to the development of a number of international standards was

recognised when he was honoured with the Paul McIntyre Award in 2019.

He has served as a lecturer in corrosion and corrosion management at Robert Gordon University since 2018 and holds a particular passion for developing young engineers, as demonstrated by working as mentor to over 50 materials engineers during his career with Shell, his role as industrial supervisor for PhD students, his active involvement in the Institute of Corrosion's Young Engineer Programme, as well as his participation in the EFC Summer School in 2022.

Dr Paterson (above) has enjoyed a long and broad career in materials and corrosion, but has always taken the opportunity to develop links with research organisations, institutes, and academia to help develop the science of corrosion and to provide the links to encourage its application in industry.

HOW THE WORKING PARTIES OPERATE AND HOW TO JOIN

Discover more about each of the Federation's 23 Working Parties and where you can take in their presentations at EUROCORR



The European Federation of Corrosion accomplishes its most important activities through the 23 Working Parties (WPs) that are devoted to various aspects of corrosion and its prevention. One of the main tasks of the WPs is to organise strong technical sessions at EUROCORR. That’s not all though as the WPs also undertake a variety of other valuable activities, which include participation in collaborative research and testing programmes, the organisation of courses and workshops, as well as the preparation of reports, guidelines and proceedings for publication in the highly regarded EFC Green Books series, of which 70 have now been published.

The WPs are overseen by the Science and Technology Advisory Committee (STAC), to which all of the WP Chairs belong. Anyone can participate in the activities of the WPs (as member of an EFC Member Society or as a nominated ‘friend’

without being a member of an EFC Member Society).

All WPs host a short ‘business meeting’ at each EUROCORR, where a range of activities are discussed and details of where to join any of the meetings can be found below. And this year, all WP Chairs and Vice-Chairs will be elected at these meetings for the next three-year term. Every EUROCORR participant physically present at a business meeting automatically has a voting right. People are encouraged to consider their candidacy for the Chair or Vice-Chair position in WPs on subjects of their particular interest. In case of interest, please contact the current WP Chair in advance.

If you are interested in any of the activities and topics covered by the EFC’s WPs, inform the WP Chair personally, or use the corresponding contact form on the WP section of the EFC website.

<p>WP 1: CORROSION AND SCALE INHIBITION</p> <hr/> <p>30 August 17:30, Hall 6</p>	<p>WP 3: CORROSION BY HOT GASES & COMBUSTION PRODUCTS</p> <hr/> <p>28 August, 17:40, Hall 12</p>	<p>WP 4: NUCLEAR CORROSION</p> <hr/> <p>30 August, 17:10, Hall 12</p>		<p>WP 5: ENVIRONMENT SENSITIVE FRACTURE</p> <hr/> <p>29 August, 14:00, Hall 11</p>
<p>WP 6: SURFACE SCIENCE AND MECHANISMS OF CORROSION & PROTECTION</p> <hr/> <p>28 August, 17:40, Hall 3</p>	<p>WP 7: CORROSION EDUCATION</p> <hr/> <p>28 August, 17:20, Hall 8</p>	<p>WP 8: PHYSICO- CHEMICAL METHODS OF CORROSION TESTING</p> <hr/> <p>See EUROCORR programme</p>	<p>WP 9: MARINE CORROSION</p> <hr/> <p>30 August, 17:30, Hall 11</p>	<p>WP 10: MICROBIAL CORROSION</p> <hr/> <p>29 August, 14:20, Hall 7</p>
<p>WP 11: CORROSION OF STEEL IN CONCRETE</p> <hr/> <p>31 August, 12:20, Hall 7</p>	<p>WP 13: CORROSION IN OIL AND GAS PRODUCTION</p> <hr/> <p>30 August, 17:10, Hall 8</p>		<p>WP 14: COATINGS</p> <hr/> <p>30 August, 12:10, Hall 5</p>	<p>WP 15: CORROSION IN THE REFINERY & PETRO- CHEMISTRY INDUSTRY</p> <hr/> <p>31 August, 10:40, Hall 10</p>

<p>WP 16: CATHODIC PROTECTION</p> <p>30 August, 11:10, Hall 14</p>		<p>WP 17: AUTOMOTIVE CORROSION</p> <p>30 August, 16:20, Hall 14</p>	<p>WP 18: TRIBO- CORROSION</p> <p>30 August, 17:30, Hall 13</p>	<p>WP 19: CORROSION OF POLYMER MATERIALS</p> <p>29 August, 17:00, Hall 14</p>
<p>WP 20: CORROSION PROTECTION OF DRINKING WATER SYSTEMS</p> <p>29 August, 17:00, Hall 14</p>	<p>WP 21: CORROSION OF ARCHAEOLOGICAL & HISTORICAL ARTEFACTS</p> <p>31 August, 12:20, Hall 14</p>	<p>WP 22: CORROSION CONTROL IN AEROSPACE</p> <p>29 August, 17:20, Hall 10</p>		<p>WP 23: CORROSION RELIABILITY OF ELECTRONICS</p> <p>28 August, 17:40, Hall 11</p>
	<p>WP 24: CO2- CORROSION IN INDUSTRIAL APPLICATIONS</p> <p>29 August, 17:00, Hall 10</p>		<p>WP 25: ATMOSPHERIC CORROSION</p> <p>29 August, 09:30, Hall 4</p>	

ADVERTISE IN THE EFC NEWSLETTER AND SPREAD YOUR MESSAGE ACROSS EUROPE

The EFC Newsletter is pleased to announce that it is now accepting advertising and welcomes enquiries. If you want to be involved then email the address below



EUROPEAN FEDERATION OF CORROSION



e-mail COO@EFCWEB.ORG to find out more

NUCOSS-23 SUMMER SCHOOL IS ANOTHER SUCCESS

Beautiful alpine surroundings contribute to the success of third Nuclear Corrosion Summer School

WP4
Nuclear Corrosion



NuCoSS-23 follows two successful events in 2015 and 2019 and this year two lucky students won a grant covering accommodation and registration to the event in beautiful Slovenian surroundings

In a beautiful Slovenian alpine resort, the third Nuclear Corrosion Summer School – NuCoSS-23 – was organised by the EFC Working Party 4 on Nuclear Corrosion (WP 4) in co-operation with the Slovenian National Building and Civil Engineering Institute. With 38 attendees (15 students and 23 scientists) and 12 lecturers from 15 countries, including Brazil, South Korea, USA, and across Europe, the school was fully booked and can be regarded as a successful event.

The mixture of content, information, social activities, and beautiful location proved extremely fruitful and a detailed report will be available on the WP 4 website. For NuCoSS-23, EFC sponsored two student grants covering accommodation and registration fee. An international jury awarded the grants to Klara Prijatelj (Slovenian National Building and Civil Engineering Institute, Slovenia) and Justice Nwade (Karlsruhe Institute of Technology, Germany). The WP 4 remain quite confident there will be a fourth edition in 2027.

SPONSORS AND SUPPORTERS



ORGANISERS



WP4 MOVE ONLINE FOR CORROSION AWARENESS

The WP 4 held its fourth online seminar on nuclear corrosion-related topics on Corrosion Awareness Day 2023.

The seminar was well attended by 65 people from 18 countries, who saw Damien Féron (former EFC and WCO President and former WP 4 Chair) host a presentation that focused on the choice of Alloy 600 in pressurised water reactors (PWRs) to its 'prohibition' and ended with a few considerations regarding the stress corrosion cracking (SCC) of stainless steels in the primary circuit of PWRs.

In addition, investigations regarding the SCC mechanisms

via the use of stable isotopic tracers were presented. The talk included a summary of the recent SCC incidents in part of the French PWR fleet and the webinar ended following an excellent discussion session. The talk and slides are available on the WP 4 website, EFC Hub and EFC's YouTube channel.

The Nuclear Corrosion session at EUROCORR 2023 will be held from Monday until Wednesday lunchtime in Hall 6. The fall business meeting of the WP 4 will also take place at EUROCORR on Wednesday 30 August at 17:10 in Hall 12. Check the EUROCORR programme for any changes.

DIGITAL AGE OF SUSTAINABLE CORROSION PROTECTION

Funded by the EU Commission and in collaboration with a number of Working Parties, the VIPCOAT Project has set out grand aims



The VIPCOAT team at EUROCORR 2022 in Berlin, where the consortium arranged a joint-session with EFC WP22, WP8, WP14, and WP6

The VIPCOAT (Virtual Open Innovation Platform for Active Protective Coatings Guided by Modelling and Optimization) project was funded by the EU Commission in 2021 as a Research and Innovation Action under the Horizon 2020 programme to accelerate the development of sustainable corrosion protection technologies by creating an open innovation platform for protective coating modelling.

Twelve partners from eight countries make up the project to develop effective corrosion protection and digitalization solutions for the coating industry, which originates from the joint initiative of several WP22 (Corrosion Control in Aerospace) participants and is endorsed by the EFC.

The VIPCOAT project aims to enable the rapid deployment of novel material modelling solutions for the production of sustainable active protective coatings using an improved decision support system, and is co-ordinated by the Helmholtz-Zentrum Hereon.

The results of the project in the first year were presented at EUROCORR 2022, where the consortium played a driving role in organising a joint-session with EFC WP22 (Corrosion Control in Aerospace), WP8 (Physico-Chemical Methods of Corrosion Testing), WP14 (Coatings), and WP6 (Surface Science and Mechanisms of Corrosion and Protection).

MODEL FUTURE

The preliminary goal of the VIPCOAT project is the development of a platform for materials modelling (OIP). The platform aims to support industrial end users in making optimal decisions in coating design, formulation, and

assessing in-service durability. It also aims to establish a platform for the effective transfer of knowledge and data communication.

The main scientific challenge of the project is to develop and link material models essential for different stages of an active protective coating design and validation. This research focus is the core of the platform demonstration, which reflects the use of simulation and material modelling tools along value chains in general. The VIPCOAT consortium is working to develop multi-scale modelling workflows and ontology-based data exchange to ensure the improved prediction of long-term corrosion protection of legacy aerospace aluminium alloy AA2024. The OIP will be launched in 2023 and aims to integrate the needs of academia, industry, society and government in a single web-based platform.

The dedicated joint session at EUROCORR 2022 was followed by the round table discussion *Modelling Sustainable Active Protective Coatings* on 30 August 2022, with the aim of discussing current industrial expectations and academic challenges in the modelling of corrosion and corrosion protection by active protective coatings. As a result of the round table, the white paper *Modelling Sustainable Active Protective Coatings* was published in the Open Repository in January 2023.

At EUROCORR 2023 in Brussels, the VIPCOAT consortium together with WP22, WP8, WP14, and WP6 are organising a joint session, as well as the round table on multi-scale modelling for design of protective coatings.

EFC GREEN BOOK SERIES CONTINUES WITH 70TH EDITION

Interactions under Tribocorrosion is the latest focus in the invaluable technical series of publications



30% DISCOUNT AVAILABLE

The ultimate resource for any corrosionist, the EFC Green Book series has 70 titles that are available in online or print editions and cover the many aspects of the corrosion industry and the work of the Working Parties

The EFC produce a variety of publications that includes this Newsletters, journals, as well as books in the form of the EFC Green Books series, which now includes the latest edition, Mechanical and Electro-chemical Interactions under Tribocorrosion: From Measurements to Modelling for Building a Relevant Monitoring Approach (EFC 70).

As many as 70 books are available in e-format or print, covering many aspects of the corrosion industry and the work of the Working Parties. This ranges from general corrosion education (EFC 52 Progress in corrosion – the first

50 years of the EFC) to specific investigations (EFC 66 – Understanding Biocorrosion / EFC 69 – Nuclear Corrosion: Research, Progress and Challenges), as well as providing guidelines (EFC 53 – Standardisation of thermal cycling exposure testing / EFC 55 – Corrosion Under Insulation guidelines). The entire Green Book series is available on the EFC website (click on the title to read the abstract) and any member of an EFC member organisation qualifies for a 30% discount when ordering via Elsevier – ask your society for the discount code. Visit the EFC website to find out more.

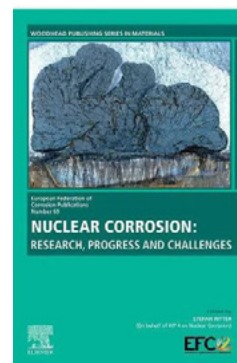
FEATURED GREEN BOOK: NUCLEAR CORROSION: RESEARCH, PROGRESS AND CHALLENGES

Nuclear Corrosion: Research, Progress and Challenges builds upon the foundations of the very first EFC book published in the Green Book series in 1989, Number 1 - Corrosion in the Nuclear Industry.

One of the newest volumes, Research, Progress and Challenges, which has been edited by Stefan Ritter, provides an overview on state-of-the-art research in some of the most important areas of nuclear corrosion. Chapters include aging phenomena in light water reactors, reprocessing plants, nuclear waste disposal, supercritical water, and liquid metal systems.

Nuclear Corrosion: Research, Progress and Challenges is the 69th publication in the Green Books series and provides a vital resource for researchers and engineers working within the nuclear field in both academic and industrial environments.

For more information, visit the EFC website.



SCHOOL ON ELECTROCHEMICAL TECHNIQUES HOST FIRST EVENT

Esteemed professor of the Daccò Centre, Cecilia Monticelli, is honoured at the event held at the University of Ferrara

The first edition of the School on Electrochemical Techniques for the Study of Corrosion was held at the University of Ferrara from 7 to 9 February 2023, to honour the memory of Cecilia Monticelli (pictured), an esteemed professor of the Daccò Centre at this University, who dedicated her entire academic and professional career to corrosion science.

The school was organised by AIM, the Italian Association for Metallurgy, in collaboration with the University of Ferrara and was designed to provide the PhD students with both the fundamentals of corrosion and an in-depth overview of the electrochemical techniques. The experimental approaches for the studying of corrosion phenomena were provided at the school in the Emilia-Romagna region of northern Italy, as were practical laboratory demonstrations.



Lectures covered a range of theoretical backgrounds, instrumentation details, and the most well-known electrochemical techniques, such as Linear Polarization Resistance, Potentiodynamic Polarizations, Cyclic Voltammetry, Electrochemical Impedance Spectroscopy, Photoelectron Spectroscopy, Electrochemical Noise, and localised electrochemical techniques.

GREAT SUCCESS

The school proved to be a great success and received significant interest, with more than 60 people participating. The majority were PhD students from various Italian universities, but the group also comprised researchers and professionals from industry companies, demonstrating the depth of the Italian school of corrosion.

Only Trenton offers Wax-Tape® brand anticorrosion wrap systems, with primers, wraps and outerwraps.



Wax-Tape® #1 Anticorrosion Wrap:

A very durable wrap that uses a thick, non-stitch bonded synthetic fabric and has no clay fillers, so it stays conformed to irregular profiles. The wrap requires no abrasion blasting, can be backfilled immediately and is compatible with cathodic protection.



Wax-Tape® #2 Self-Firming Anticorrosion Wrap:

A unique, microcrystalline-wax-saturated wrap that slowly firms up to provide excellent aboveground and belowground protection. Comes in a variety of colors and usually requires no outerwrap.

UNLOCKING THE POTENTIAL OF NI-BASED MATERIALS

Ni-based coatings can replace Pt in energy and digital storage applications according to the NICKEFFECT Project



The NICKEFFECT Consortium face the camera at the kick-off meeting in San Sebastian, Spain on 1 June 2022

Electric mobility and renewable energy sectors largely contribute to hydrogen economy constituting one of the pillars in clean energy solutions. Within this framework, fuel cells (FC) emerge as clean energy devices that directly convert the chemical energy of hydrogen into electricity through an electrochemical reaction, not combustion, thus producing only water as a by-product. Water electrolysis (WE) is another key focus. Currently, most hydrogen is produced from natural gas, that leaves a significant environmental footprint. Therefore, electrolysis is a promising option for green hydrogen gas generation. The potential of both technologies to reduce the greenhouse gas emissions is truly remarkable.

Nevertheless, there are challenges to overcome. Traditionally, both markets heavily rely on the use of Pt and other Pt-group metals (PGMs) as cathode electrocatalysts due to their outstanding activity. Nonetheless, the scarcity and high cost hinder the widespread adoption of these sustainable energy solutions. Specifically, since 2011 European Commission classifies PGMs as critical raw materials (CRM), meaning they are highly important for the European economy, however, have a high supply risk.

Nickel-based materials emerge as promising alternatives for PGM reduction, offering abundant availability and attractive properties for catalytic and magnetic applications. While cost-effectiveness is an obvious advantage of any non-noble catalyst, the durability of materials under harsh environments employed in energy production or conversion is an issue. This is where corrosion

science comes into play. For instance, the state-of-the-art non-noble catalysts for proton exchange membrane (PEM) FC should withstand at least 5 000 h in acidic environment under constant current (or potential). Even though the catalysts' corrosion mechanisms are still not well understood, it has been observed that during the operation, several degradation processes may take place.

These include metal dissolution and leaching, particles agglomeration and coarsening, chemical poisoning due to materials interaction with other cell components, as well as mechanical stress and strain (for example, vibration or thermal cycling), which can cause physical damage to catalyst layers or support structures, leading to reduced performance and stability. Therefore, investigation and understanding of the complex physical and electrochemical processes that govern catalyst degradation, as well as exploring various surface modification techniques to mitigate corrosion is a key enabling the development of durable PGM-free materials.

ENHANCE PERFORMANCE

NICKEFFECT project, Ni-based ferromagnetic coatings with enhanced efficiency to replace Pt in energy and digital storage applications, aims at development of novel PGM-free Ni-based catalysts for next-generation water electrolyzers and fuel cells. The interest of the project also spans to Pt replacement in electronic devices to allow for a more sustainable low-power consumption. NICKEFFECT will enhance Ni-based materials' performance by fabricating

specimens with tunable microstructure and porosity levels, thus able to reach similar efficiency levels as compared to Pt-based counterparts. The most promising compositions will be integrated in membrane electrode assemblies (MEA) for water electrolyzers and fuel cells, or as magneto-resistive random-access memories (MRAM) stack coatings, achieving at least 85% reduction in use of PGMs.

The project also aims to develop and bring to the market new solutions and tools for materials and process modelling, as well as for decision making, therefore providing methodologies to follow safe- and sustainable-by-design (SSbD) criteria in materials' design and manufacturing to support the European industry.

STRONG CONSORTIUM

To achieve the project goals NICKEFFECT gathers a strong consortium of 12 partners, a diverse range of experts, combining the strengths of academia and industry. CIDETEC, the only technological centre in Spain specialising in Surface Engineering, leads the consortium as the project coordinator. Together with the Autonomous University of Barcelona (UAB), CIDETEC develops and characterises different alternatives of Ni-based catalysts. The production of the most promising ones will be upscaled in a pilot plant (pictured below)

The upscaled deposition of materials is supported by advanced process modeling developed at Free University of Brussels (VUB) and Elsyca. The realistic process models allow to perform a computer-aided engineering of the pilot cell, ensuring high-quality deposits with complex geometries while reducing rework, scraps, and environmental impact.

ADVENT Technologies, a leading company in electrolysis and fuel cell systems, evaluate the produced demonstrators

in real environments. The Commissariat à l'énergie atomique et aux énergies alternatives (CEA), a major European research institute, also validates materials at real working conditions and assesses the performance of NICKEFFECT's materials in low-temperature PEM FC and PEM WE, following the EU Harmonized protocols. SINGULUS, an industrial partner specialising in sustainable coating and surface technologies and production processes, integrates the developed magnetic materials into MRAMs.

In parallel, NICKEFFECT builds a modular decision support tool for materials selection based on the SSbD criteria. The tool includes modules for materials modeling carried out at Matgenix, to accelerate selection through predictive properties and guiding experimental work. Chemical risk assessment (CEA), as well as environmental and cost impact assessments lead by Innovation in Research and Engineering Solutions (IRES) are also integrated into the materials data base, which is maintained and curated by ANSYS. Last, but not least, the project activities are supported by Asociación Española de Normalización (UNE) that is in charge of standardisation activities, and F6S - a global startup network and the dissemination partner of NICKEFFECT.

After one year of running, the project has started bringing its first results. Integrating corrosion science in the development of PGM-free materials and following the SSbD principles, NICKEFFECT will unlock the full potential of Ni-based materials for catalytic and magnetic applications that pave the way towards more sustainable, efficient and affordable clean energy solutions.



CIDETEC's pilot production line, where the manufacturing of the most promising catalysts will be upscaled in collaboration with the Autonomous University of Barcelona

SHINING A SPOTLIGHT ON SPANISH SOCIETY, SOCIEMAT

Spearheaded by the Specialised Group of Corrosion, the Spanish materials society has launched many corrosion prevention initiatives



Teachers and students smile for the camera during the delivery of diplomas ceremony at the High Specialization Course in Corrosion ALESCORR 2023

Throughout its almost 30-year history, SOCIEMAT has been at the heart of corrosion prevention in Spain and tens of activities have been held, organised, and supported by the Association.

Following the huge success of EUROCORR 2019 congress organised by SOCIEMAT in Seville, the Association has helped to establish the importance of corrosion in the field of materials science in Spain. SOCIEMAT provides answers to the national community of corrosionists, increases co-operation and helps to improve the visibility of the research lines that are currently carried out across Spain.

SPECIAL GROUP

So, in 2020 the Specialised Group of Corrosion was born, made up of the main researchers belonging to universities, technology centres and companies. Together, they represent the most important Spanish entities dedicated to the investigation of corrosion, degradation of materials and surface treatments.

As a result of the joint work of this group, several initiatives have been launched. This includes the establishment of specific symposiums on the subject in the National Congresses of Materials, CNMAT, which SOCIEMAT

holds every two years. In addition, the 30-hour High Specialization Course in Corrosion (ALESCORR) has also been launched and focuses on the principles of corrosion and the use of electrochemical techniques for its study, while ALESCORR celebrates its second edition this year.

CORROSION IN SPAIN: A HISTORY OF SOCIEMAT

Established in 1996, the Spanish Materials Society (SOCIEMAT) is a non-profit organisation whose main objective is to increase and disseminate knowledge about materials science and engineering at a regional, national, European, and international level through the publication of e-journals, conferences, courses, and congresses, including CNMAT, which SOCIEMAT holds every two years.

PHOTO OPPORTUNITY

As a prominent element in the dissemination activities carried out by the group and with the aim of making the public more aware of the importance of corrosion in daily life, activities linked to World Corrosion Awareness Day have also been developed, which include the Photography Contest on social media, FOTOCORR, which has been made open to the citizenship. SOCIEMAT also hosts conferences on World Materials Day to increase and share knowledge of materials science and engineering.

World Materials

Day is celebrated by the member societies of the European Federation of Materials Societies, FEMS, with the aim of highlighting the importance of materials in our daily life. Open your phone camera over the QR code to find out more.



CIDETEC HOST NDTCORR INTERNATIONAL WORKSHOP

The *Detection and Monitoring of Corrosion Phenomena by Non-Destructive Techniques (NTDs)* workshop was EFC Event no. 496



Ideally suited to experts in the field of corrosion and non-destructive testing techniques, NDTCorr in San Sebastián welcomed a range of presentations in English, which were delivered to around 50 participants

CIDETEC Surface Engineering hosted the NDTCorr in San Sebastián in May, which brought leading companies and research organisations in the field of NDTs and corrosion monitoring together in a productive workshop to identify non-destructive techniques in corrosion monitoring.

The workshop, which emerged from the Clean Sky2 EC-funded U-CROSS project – *Early detection and progress monitoring and prediction of corrosion in aeronautic Al alloys through calibrated Ultrasonic CorROsion Sensors application* (Clean Sky 2, H2020) was conceived to meet the need of reviewing the wide range of non-destructive techniques (NDTs) used, or being developed in different industrial fields for detecting or monitoring different forms of corrosion. The consortium includes: Cidetec Surface Engineering, UBFC, Titania Ensayos Proyectos Industriales, Mistras Group and INSA Lyon.

Held in the seaside city of the Basque country in the north of Spain (where CIDETEC are based, right), the workshop involved leading NDT and corrosion monitoring companies and research organisations. This combined approach resulted in a broader vision of the topic, gathering perspectives from the industry, facilities owners, and solution suppliers, as well as from the academic and research community.

During the workshop, 12 talks were presented. The general context was brought to the table with the opening talk delivered by CIDETEC, which provided a broad overview of different physical

and electrochemical techniques that are employed, or can potentially be employed for corrosion monitoring and inspection. Presentations of both universities and research centres (VUB, HEREON, INSA Lyon, CIDETEC), as well as companies (AIRBUS, MISTRAS, ZENSOR, INNERSPEC, EVIDENT, OLYMPUS, EDDIFI, DAS-NANO) filled two days with interesting discussions on acoustic emission, operando EIS, data analysis and modelling based on optical imaging, ultrasonic, magnetic or terahertz-based techniques.

The NDTCorr's success went beyond expectations, as the event was very positively received from the attendees and participants (more than 50 people were in attendance), who expressed their interest on next editions due to the growing concern of industry and academia on the topic of corrosion monitoring by means of non-destructive techniques.

To find out more visit the CIDETEC website.



THE FCI INTEGRATE AI INTO CORROSION RESEARCH

The results will be presented by Johan Becker at EUROCORR in the session *JS 7 Corrosion Sensing, Monitoring and Prediction*



FIND THEM
IN HALL 9
@EUROCORR

Headquartered in Brest, with a second site in Saint Etienne, the French Corrosion Institute employs 38 people focused on research and development, consultancy, and corrosion testing

The French Corrosion Institute (FCI), a subsidiary of RISE Research Institutes of Sweden, has announced it has plans to extend its AI model's capabilities to predict corrosion under a wider range of climatic conditions.

Together with RISE, the FCI has a broad expertise in corrosion and anti-corrosion with over 100 specialists active within the field. Focused on developing corrosion monitoring solutions based on electrical resistance (ER), which have proven to be invaluable tools in industrial and academic projects, the ER corrosion sensors provide real-time insights into corrosion rates and degradation mechanisms across various applications, such as atmospheric and marine corrosion, transport, and preventive conservation of cultural heritage.

The FCI recognized the potential of integrating artificial intelligence (AI) into their corrosion sensor and monitoring activities. The possibility to acquire a large amount of real-time corrosion rate data, associated to in-situ environmental information and large testing facilities, both accelerated and on-site, was identified as a real asset to develop methods to build predictive models using AI.

As a first approach, an AI model was developed to predict corrosion rates under various accelerated corrosion test (ACT) conditions by using real-time corrosion data from steel and zinc sensors. The model was trained using corrosion monitoring from tailored and standard ACTs. To assess its accuracy, the model underwent validation testing, which was independent of its training data. First results based on more than 100 sensors and 15 ACTs proved very

promising. The AI model effectively predicted real-time corrosion rates by accounting for climatic and dynamic conditions, such as salt concentration, contamination frequency, relative humidity, and temperature. The model could help to better understand the real-time and high kinetic reactions and dose-response mechanisms, providing perspectives in designing and understanding of accelerated corrosion tests.

STEP FORWARD

Based on the proposed method, combining big data and numerous field exposures, efforts are underway to extend the model's capabilities to predict corrosion under a wider range of climatic conditions to reach real outdoor scenarios in the future. The integration of AI in corrosion research marks a significant step forward and offers the promise of improved corrosion prediction, and a deeper understanding of corrosion mechanisms. With continued advancements and refinements, AI-powered corrosion monitoring holds tremendous potential in corrosion control and mitigation strategies.

Results of this work will be presented at EUROCORR 2023 on 28 August at the session *JS 7 Corrosion Sensing, Monitoring and Prediction* by Johan Becker with title: *Corrosion Rate Prediction of Zinc and Steel in Accelerated Corrosion Tests Using Machine Learning and Real-Time Corrosion Sensors*. For any information regarding AI and ER corrosion sensors, contact Johan Becker.

J. Becker, E. Diler, F. Vucko and F. Tanguy

EFC PROVIDE KEYNOTE SPEECH AT SURCAR CONGRESS

The lecture, *Corrosion Challenges Towards a Sustainable Society* was presented to 240 delegates of the car body finishing community



Chair of the Working Party on Automotive Corrosion, Elizabeth Szala spoke of the corrosive challenges that face the future in Cannes

The EFC was proud to be offered a keynote lecture on *Corrosion Challenges Towards a Sustainable Society* during the last SURCAR Congress in France.

The Chair of the Working Party 17 on Automotive Corrosion, presented examples on this subject to the 240 delegates of the world class event for the car body finishing community in Cannes on the French Riviera from 15 to 16 June, and provided the ideal opportunity to convince a new audience to participate at EUROCORR in the future.

Szala is a Senior Expert R&D Engineer at Aluminium Duffel and her lecture highlighted how a global transition towards more sustainable, affordable and reliable energy systems is being stimulated by the Paris Agreement and the United Nation's 2030 Agenda for Sustainable Development.

Her lecture at the biennial congress dedicated to the

Automotive Body and Paint Finishing Industries discussed how this poses a challenge for industry, as building climate-resilient energy systems and infrastructures brings with it a long-term direction, so as a result the long-term behaviour of structural materials (mainly metals and alloys) becomes a major prospect.

With this in mind, the lecture presented a series of cases showing the importance of corrosion protection of metals and alloys in the development of energy production to further understand the science of corrosion, and bring the need for research and the consequences of corrosion into public and political focus. This includes emphasis on the limitation of greenhouse gas emissions, on the lifetime of infrastructures, implants, cultural heritage artefacts, and a variety of other topics.

EFC ADMINISTRATION INFORMATION UPDATE

PRESIDENT: Tomáš Prošek, Prague, Czech Republic

VICE-PRESIDENT: Gareth Hinds, Teddington, Middlesex, United Kingdom

CHIEF OPERATING OFFICER: Pascal Collet, Senlis, France

SCIENCE AND TECHNOLOGY ADVISORY COMMITTEE (STAC) CHAIR:

Stefan Ritter, Villigen, Switzerland

SCIENTIFIC SECRETARY: Roman Bender, Frankfurt/

Main, Germany

FRANKFURT OFFICE: Andreas Förster / Ines Honndorf

PARIS OFFICE: Philippe Marcus / Pascale Bridou Buffet

LONDON OFFICE / HONORARY TREASURER: Colin Church / Gareth Hinds / Julija Bugajeva

EFC NEWSLETTER EDITOR: Dan Mobbs

GENERAL CONTACT: offices@efcweb.org

A NOVEL REPAIR COATING FOR OFFSHORE WINDMILLS

The self-adhesive PIB-based coating with a UV-resistant hydrophobic backing could extend the lifetime of offshore wind tower assets



ABSTRACT

An alternative coating repair method was designed with a few key factors in mind, including turn-around time, health, safety, environment, and sustainability. The paper discusses the evolution of the field applied coating as a repair method for damages caused during installation and as maintenance for aged coatings. Selecting the correct mix of polymers with zero hazardous chemicals or VOCs made it a good choice for the health of the applicators. Immediate adhesion to various substrates and coatings with minimum surface

preparation made it simple and effective, with no hazardous components leaking into the environment.

Choosing the right polymers can extend service life and/or an extended maintenance period, which provides a contribution as 'green' energy and therefore sustainability. Innovation comes with challenges in recognising and meeting the requirements of standards made for different coatings, such as ISO 12944-CX, which is highlighted as a guide to the offshore coating performance predictor.

Offshore wind towers are commonly foreseen with factory-applied anti-corrosion coatings that consist of multi-layer two-component protective paint systems, like epoxies or polyurethanes. These coating systems have various requirements in place for application and curing conditions like a high degree of surface cleanliness of steel, roughness profile for achieving proper adhesion, low levels of salt contamination on the surface, and appropriate control of temperature and humidity during curing.

During transport and installation of the coated towers, the factory-applied coating often gets damaged. Repairing with the same type of coating is almost impossible due to many factors like mobilisation of equipment used for abrasive blast cleaning in an uncontrolled environment and the time needed for the coating to cure. In addition to this,

many types of two-component protective paint systems contain substances that are hazardous to people and the environment, while they can also generate substantial amounts of hazardous waste like blasting media and paint remnants left behind in containers.

Furthermore, challenges respecting intercoat curing times in changing and uncontrolled environments add to the complexity of completing the job within the limits. This triggered the idea of developing a new repair coating system that would eliminate many drawbacks of traditional two-component protective paint systems if not all.

PIB-TYPE COATING

It was speculated that a coating material based on pure isobutene homopolymer called Polyisobutene (PIB) could

be used for the development of a repair coating for atmospheric services that would assist in extending the lifetime of offshore wind tower assets. PIB-based coatings are commonly used for the protection of pipelines in buried and submerged conditions against corrosion and they meet the minimum requirements of ISO 21809-3 1 standard common in the oil and gas industry.

This standard includes requirements for properties like glass transition temperature, drip resistance, and adhesion to various substrates before and after accelerated thermal

aging and hot water immersion. These PIB-based coating systems had been in use for over 20 years proving reliable corrosion protection.

The PIB-type coating that was developed comprises a self-adhesive compound based on PIB and a UVresistant hydrophobic backing film.

To understand if this would be fit for purpose, various tests were performed under laboratory conditions and field inspections were conducted after being in service for several years.

NORTH SEA CASE STUDY

The PIB-based coating product was first installed on a relatively large scale on an offshore wind farm in the Dutch North Sea in 2016. During the installation and commissioning of the offshore wind farm several areas of coating damage were found on the towers, transition pieces, and on various areas of structural steelwork. The product was installed at various locations where the factory-applied coating was damaged during transportation or installation.

Repairs were achieved partially by rope access and also included surface preparation to the St2 standard, solvent cleaning by wipes impregnated with isopropyl alcohol, cutting the repair coating to size with scissors or safety knife, before applying the patch to the damaged area using a pressure application roller.

These small areas of damage were relatively insignificant on day one of the operation on the wind farm, but left unattended the condition of the coating would be expected to deteriorate over time. After a prolonged period this could result in the failure of the structural integrity of the asset, or render the turbine unsuitable for repowering. These repairs took considerably less time when compared to traditional field repairs with the non-PIB-based coating systems.

Another benefit of the PIB coating systems were that any waste materials left over after job completion are fully recyclable. The repair sections were visually inspected in 2022 to

assess the condition of the repair PIB-based coating and no anomalies were observed on any of the repair sections. The picture (left) was taken during the service when the site was revisited six years after the coating repairs were initially carried out. The inspection offshore found no deterioration over the six year period, including no UV degradation.



CONCLUSIONS

The repair coating consisting of a self-adhesive PIB-based corrosion protection coating and a UV resistant hydrophobic backing film is potentially suited for extending the lifetime of the parts of offshore wind tower assets in atmospheric zone services.

Although not all requirements for the other ISO 12944- 9 3 non-PIB-based coatings were met, the five-year field exposure in atmospheric zone offshore conditions in the Dutch North Sea revealed that the PIB-based repair coating

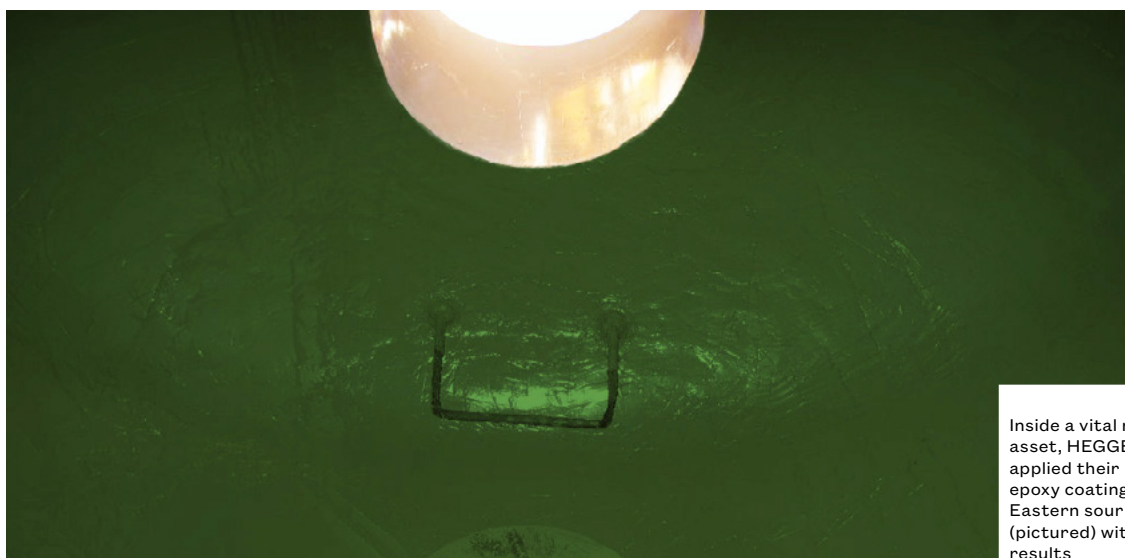
has a great potential in further extending the service life of wind towers and attached constructions.

Based on the findings of the presented laboratory testing and five-year field atmospheric zone offshore exposure experience with the PIB-based type corrosion prevention coatings, it appears that a new type of testing methodology needs to be developed in co-operation with the industry for the advancement of PIB-based corrosion prevention coatings.

To find out more, visit the Seal For Life website.

HEGGEL RISE ABOVE CORROSION CHALLENGES

Finding sustainable protection strategies in a Middle Eastern gas sweetening plant with a high-tech hybridized polymeric coating



Inside a vital refinery asset, HEGGEL GmbH have applied their hybridized epoxy coating to a Middle Eastern sour gas refinery (pictured) with encouraging results

Oil and gas facilities, especially gas sweetening plants, are prone to extreme corrosion, particularly within amine sweetening units, but HEGGEL have produced a hybridized epoxy coating that has provided a sustainable protection solution at a Middle Eastern sour gas refinery.

Harsh conditions like high temperatures, pressure, and corrosive gases can cause disruptions, degraded quality, and material loss. Traditional temporary mitigation methods falter under severe conditions, highlighting the need for sustainable strategies like protective coatings. These solutions can prolong equipment life, enhance efficiency, and guard against environmental wear and corrosion, therefore reducing costs.

With that in mind, HEGGEL have produced a hybridized epoxy coating, which has been engineered for superior chemical resistance, adhesion, and stability in harsh environments, according to the company based in Essen, Germany. Intended for particular use in sour gas refineries,

it resists corrosion damage at high temperatures, making it an effective choice for comprehensive corrosion protection.

These features were convincingly demonstrated in a Middle Eastern sour gas refinery, where it displayed its resilience. The coating was applied in various areas, from chemical tanks and process vessels to critical components of sour gas services, such as amine treating units, reboilers, and regenerators, helping to underscore its versatility and effectiveness.

The hybridized epoxy coating exhibited strong chemical resistance and thermal stability, validating its capability under severe conditions and elevated operating pressures. Economically viable and with ambient-curing properties, the coating can be applied as a single coat, or layered for increased dry film thickness (DFT), which contributed to its consistent performance over several years in the challenging natural environment of this Middle Eastern sour gas refinery.

HIGH-TECH HYBRIDIZED POLYMERIC COATING

The two-component hybridized epoxy coating excels in extreme environments according to its manufacturer, thanks to its chemical resistance, adhesion, and stability. A blend of organic and inorganic molecules with a cross-linked structure designed for protection, it provides thermal stability and resistance against harsh

environments in a broad scope of anti-corrosion applications. HEGGEL claim that an ambient cured single-coat of the coating has specific properties that resist sludge build-up, sliding and abrasion damages efficiently preserving surfaces against high-temperature corrosive steams and fluids present at the same time.

C-CUBE INTERNATIONAL ANNOUNCE A2CQM PROJECT

New collaborative project promotes interactive drone-based systems as a solution to assessing assets in the industry



Flying in the face of convention, C-Cube's A2CQM project aims to develop an interactive drone-based system capable of autonomously inspecting and assessing the condition of assets in the industry

C-Cube, in collaboration with HighlightDynamics and Helvetis, are initiating a project named A2CQM, which aims to develop an interactive drone-based system capable of autonomously inspecting and assessing the condition of assets in the industry.

The name A2CQM stands for Autonomous Aerial Coating Quality Measurement and addresses the significant challenge of the corrosion of assets posed to industries worldwide. Not only affecting the integrity of infrastructure, corrosion also leads to reduced asset lifetime, increased maintenance costs, and safety hazards. To protect the steel assets against corrosion, coatings are used in the most cases. However, coating failure is unpredictable and leads to high costs, safety problems and reduces asset lifetime.

To mitigate these issues, there's a growing need for effective and efficient inspection and maintenance processes. However, traditional methods can fall short in accuracy, speed, and cost-effectiveness. With this in mind, the A2CQM project aims to revolutionize the corrosion industry through the integration of robotics and advanced inspection technologies.

FEATURES AND BENEFITS

- Improved Inspection Efficiency: The autonomous drone can safely and rapidly cover large areas and access difficult-to-reach locations, reducing inspection time and eliminating human exposure to hazardous environments.
- Enhanced Data Accuracy: The high-resolution sensors and imaging technology on A2CQM ensure precise

measurement of coating thickness, corrosion damage, and other key indicators. This data enables timely decision-making and targeted maintenance interventions.

- Real-time Data Analysis: A2CQM incorporates data analysis algorithms that process inspection data in real-time, which enables immediate identification of issues.

- Cost-effectiveness: By automating inspection and maintenance processes, A2CQM aims to eliminate the need for extensive manual labour and reduces operational costs associated with downtime, repairs, and asset replacement.

- Prediction of coating lifetime: The data collected by the CQM drone is used to predict coating failure, which can be used to optimize maintenance activities and reduce risks.

The A2CQM system will leverage state-of-the-art sensor technology to capture high-resolution data on coating degradation, coating thickness, corrosion damage, and other relevant parameters. The drones will be equipped with advanced imaging and sensing capabilities to perform inspections in challenging environments, including offshore platforms and confined spaces.

According to C-Cube, the A2CQM project represents a step forward in the corrosion industry, providing a transformative solution for asset inspection and maintenance. With the help of robotics, sensor technology, and data analysis, A2CQM enables accurate, efficient, and cost-effective corrosion assessment. Its implementation is intended to extend the lifespan of assets, improve operational efficiency, and ensure the safety and integrity of critical infrastructure.

YOUNG RESEARCHERS HONoured AT GN CORR 2023

The Italian national conference on corrosion and protection (EFC Event No. 491) visits Turin



Over 130 attendees saw 66 papers presented on a range of different topics at the three-day Giornate Nazionali di Corrosione e Protezione, which was this year held in Turin.

The 15th edition of the Giornate Nazionali di Corrosione e Protezione - the Italian Conference on Corrosion and Protection - was held in Turin, Italy from 5 to 7 July 2023 and chaired by Prof. Emma Angelini of Politecnico di Torino.

First held in Milano in 1992, the conference is the main national event for researchers from academia and industry interested in scientific and technological issues in the field of corrosion and protection of metals. The conference is organised every two years by the Italian Association of Metallurgy (AIM) in collaboration with APCE (Italian association and EFC member devoted to the study of cathodic protection), as well as AMPP Italy Chapter, and this year they are joined by Politecnico di Torino as well.

The 2023 three-days event, sponsored by AMEL, CESCOR and EVIDENT OLYMPUS attracted over 130 attendees and the presentation of 66 papers on different topics, including coatings and surface treatments, corrosion of aluminium, corrosion and additive manufacturing, corrosion in concrete, microbial corrosion and cathodic protection. Moreover, considering the long experience on corrosion and protection of cultural heritage of the research group of Politecnico di Torino, special attention was paid to this topic. Most papers presented will be published, after peer-review, in two special issues of La Metallurgia Italiana.

Encouraged by the large participation of PhD students and young researchers, the Scientific Committee

presented the Best Oral Presentation Award for Young Researcher in memory of the late prof. Cecilia Monticelli to Leila es Sebar (Politecnico di Torino) and Elena Messinese (Politecnico di Milano). The next GNC will be in Ancona in July 2025.



UPCOMING EFC EVENTS 2023-2025

Make a date in your corrosion calendar for all the latest EFC events and conferences from around the world

EUROCORR 2023

Brussels, Belgium, 27-31 August 2023
Organised by VOM asbl in collaboration with the University of Mons (UMONS), the Vrije Universiteit Brussel (VUB), Materia Nova, and DECHEMA
To find out more, [click here](#).

MECHANISM OF HIGH TEMPERATURE CORROSION AND OXIDATION

Marktheidenfeld, Germany, 25-29 September 2023

EFC Event No. 493

Organised by DECHEMA e.V.

Scope: High temperature corrosion studies are more relevant than ever to meet today's challenges in energy production. Fundamental and applied research in this field plays an essential role in the successful shift from the conversion or combustion of fossil fuels to heterogeneous renewable fuels and renewable energies. Associated with the shift to renewable and carbon neutral processes are generally higher temperatures, novel process conditions and media such as salt melt exposures.

To find out more, [click here](#).

HIGH TEMPERATURE CORROSION AND OXIDATION 2023 WORKSHOP

Marktheidenfeld, Bavaria, Germany, 25 -29 September 2023
The programme for the event is available on the Dechema website. Topics will include:

- Fundamental understanding of corrosion mechanisms at high temperature
- Oxidation/Corrosion studies in corrosive gases, salts and slags
- Alloy and coating design for high-temperature oxidation/corrosion and mechanical performances
- Advanced characterization and modeling/lifetime predictions

To find out more https://dechema.de/en/WS_HTC2023.html

28TH INTERNATIONAL CONFERENCE ON MATERIALS AND TECHNOLOGY (28 ICM&T)

Portoroz, Slovenia, 11-13 October 2023

EFC Event No. 499



Organised by the Institute of Metals and Technology, Slovenian Materials Society

Scope: 28th International Conference on Materials and Technology (28 ICM&T) is a meeting of professionals from research institutes, universities and industry that are active in the fields of: metallic materials, biomaterials, 3D-printed materials, composite materials, ceramics, nanomaterials, simulation and modelling. The main goal of the 28th Conference on Materials and Technology (28 ICM&T) is to establish a dialogue between the needs of industry and the research of the academic sphere, and it represents a platform for efficient transfer of knowledge from research institutions to industry. A special section dedicated to students is a long-established tradition of the conference. Young researchers (younger than 35 years) will be given an opportunity to present their works in 10-minute oral presentations including discussion. An international jury panel will award the best presentations. Young researchers have also an opportunity to present their work in poster session. Best poster presentation will be awarded.

Website: <https://www.icmt28.com/en/>

CORROSION & PREVENTION 2023

Perth, WA, Australia, 12-16 November 2023

EFC Event No. 502

Organised by the Australasian Corrosion Association

Scope: The preeminent corrosion conference for the Australasian region. We host seminars, plenaries, social events, Awards, networking opportunities and more. It draws international crowds and contributors and attracts some of the most esteemed figures in the industry.

Website: <https://conference.corrosion.com.au/>

3RD CONFERENCE & EXPO - SHARING KNOWLEDGE, THE WAY TO GO!

Genova, Italy, 9-11 June 2024

EFC Event No. 500

Organised by the AMPP Italy Chapter (ex Nace Italia Milano Section)

Scope: The Conference is aimed to collect specialists from Europe and worldwide to discuss topics concerned with any fundamental, engineering and applied aspects in the field of corrosion prevention, while the Expo will present materials, equipment and services addressing corrosion prevention systems.

The call for papers is open. Abstract submission deadline: 15 September 2023

Website: <https://www.amppitaly.org/genoa/2024>

ACHEMA 2024 - CONGRESS

Frankfurt/Main, Germany, 10-14 June 2024

EFC Event No. 498

Scope: AICHEMA addresses current issues and developments that move our community. The AICHEMA congress focusses on application-oriented research and the development, from proof-of-concept to the threshold of market entry. Current trends within process technology are highlighted as well. Topics will include, process innovation, pharma innovation, green innovation, lab innovation, digital innovation, and hydrogen innovation.

Join us at AICHEMA 2024's congress for shaping the future of process industry along our innovation themes.

The call for papers is open. Deadline for abstract submission: 6 October 2023

Website: <https://achema.de>

EUROCORR 2024

Paris, France, 1-5 September 2024

EFC Event No. 495

EFC's annual EUROCORR conference in 2024 is hosted by CEFRACOR, the French Corrosion Society.

Scope: The programme will include plenary lectures, keynote lectures, oral and poster presentations in all the areas covered by the EFC Working Parties. In addition, the following topics will be included: Corrosion and corrosion protection issues in additive manufacturing; Design and performance of corrosion resistant High Entropy Alloys (Multi-Principal Element Alloys); Durability of materials for hydrogen energy systems; Certification in corrosion and corrosion protection.

To find out more, [click here](#).

EUROCORR 2025

Stavanger, Norway, 7-11 September 2025

EFC's annual EUROCORR conference will be heading to Scandinavia in 2025.

For the complete listings of future corrosion events around the world, visit the [EFCalendar of Events](#).

SAVE THE DATE!

9TH INTERNATIONAL WORKSHOP ON LONG-TERM PREDICTION OF CORROSION DAMAGE IN NUCLEAR WASTE SYSTEMS (LTC 2025)

Sendai, Tohoku Region, Japan, 4-6 November 2025

EFC Event No. 501

Japan Society of Corrosion Engineering (JSCE), Nuclear Waste Management Organization of Japan (NUMO) and EFC WP4 on Nuclear Corrosion

Scope: Overview on national disposal programmes with emphasis on similarities, common challenges and different approaches, regulatory issues, retrievability, etc. Development of and long-term performance assessment of high-level waste disposal containers. Experimentation with candidate materials, including laboratory tests, full-scale demonstration, in-situ testing, methodology, modelling, monitoring and design.



Organised by the AMPP Italy Chapter (ex Nace Italia Milano Section), the 3rd Conference & Expo will visit the port city of Genoa, the capital of north west Italy's Liguria region

FUTURE EVENTS FOR THE DANISH MEMBER SOCIETY

Affiliated to the Danish Academy of Technical Sciences, EFC member society ATV-SEMAPP have a full calendar of events planned



Over 130 attendees saw 66 papers presented on a range of different topics at the three-day Giornate Nazionali di Corrosione e Protezione, which was this year held in Turin

FREE WEBINAR ON BIOFOULING AND MICROBIOLOGICALLY INFLUENCED CORROSION – THEORY MEETS PRACTICE

Online via MS Teams

26 September 2023, 10:00 – 11:30 a.m.

Scope: Growth on wet surfaces and the development of biofilms are well known in nature and in technical industrial systems. The bacteria in biofilm can cause damage to the material if microbiologically influenced corrosion (MIC) is allowed to develop uncontrolled on surfaces.

This webinar includes two presentations that will address different ways of controlling biofouling and microbiologically influenced corrosion.

Docent and Project Manager Torben Lund Skovhus will describe the theory behind biofilm formation, provide examples of various corrosion mechanisms for bacteria in water systems, and describe how MIC is managed most effectively. Current examples will be included of a newly established sprinkler plant in a hospital and various offshore production facilities in the North Sea. Finally, a new approach to Failure Analysis (Root Cause Analysis) is presented where DNA-analysis is included, and MIC is the degradation mechanism.

Senior Project Consultant Matthias Graff of Danfoss will illustrate the corrosion risk connected with fouling and MIC and teach participants how to identify possible risks in their own systems. He will also give an overview on microorganisms that can cause corrosion. The term “biofilm” will be explained as well as the limitations for

microbial life, i.e. formation of biofilm. Finally, several MIC case studies will be presented.

The webinar will focus on substantial parts of presentations recently held at VIA University College in Horsens, Denmark, and Alfa Laval in Lund, Sweden, but will not be identical.

The programme and registration information is available on the [ATV-SEMAPP website](#).

CORROSION CONTROL FOR A GREENER WORLD – A SHORT COURSE ON THEORY AND PRACTICE

Technical University of Denmark, 2800 Lyngby, 22-23 January 2024

Scope: The idea of this corrosion course is to provide a good theoretical and practical understanding of corrosion, and how corrosion can be identified, monitored and controlled using a combination of lectures and hands-on experimental sessions.

Hence, the course will be suitable both for research students as well as for persons employed in the industry involved in material related aspects, material selection, and corrosion issues at a product level, corrosion prediction and control. The level of the course will be preliminary to medium so that it will be suitable for both beginners and those who wish to enhance their knowledge on corrosion in practice.

Each theory part of the course will be complimented with practical exercises and case studies. The course will also elaborate on how corrosion is important in relation to green

transition where efficient material selections are needed for efficient products by lower material loss and less contamination of the environment.

The programme is available on the [ATV-SEMAPP website](#).

TRAINING COURSE ON CORROSION MANAGEMENT AND FAILURE ANALYSIS: MICROBIOLOGICALLY INFLUENCED CORROSION (MIC)

Syddanske Forskerparker, 5230 Odense, 29 February – 1 March 2024

Scope: The course will cover basic corrosion management principles, basic MIC mechanisms, use of molecular microbiological methods (MMM) in diagnosing and managing MIC, selection of MIC mitigation methods, selection and interpretation of MIC monitoring methods, case studies demonstrating MIC diagnostic tools, failure analysis principles, MIC modelling and demonstrate applicable sampling techniques and equipment.

Learning objectives of the training course include:

- Be able to apply the latest Industry Guidelines and Standards on Corrosion Management and Microbial Corrosion of Engineered Systems
- Be able to apply Corrosion Management principles to assessing, mitigating and monitoring the corrosion threat of MIC
- Understand, and correctly apply and interpret state of the art MIC diagnostic methods

→ Understand sampling procedures for various sample types obtained in the water, process and energy sector

→ Be able to plan and execute a failure analysis investigation where MIC is the root cause

The programme is available on the [ATV-SEMAPP website](#).

CLIMATIC RELIABILITY OF ELECTRONICS – CHALLENGES AND PERSPECTIVES – THE 9TH INTERNATIONAL SEMINAR

DTU Lyngby, Technical University of Denmark, 2800 Kgs. Lyngby, 21-22 March 2024

Scope: Today environmental conditions affect functionality of electronic systems, as they are part of all technological applications. Extensive use of power electronics as integral part in many applications such as renewable energy, transportation, and automotive electrification resulting in exposure to harsh climatic conditions and electrochemical/corrosion failure modes.

This is a yearly seminar focusing on the climate related issues of electronics bringing together electronics/electrical and material/corrosion experts. Broadly, seminar will address topics related to low/high voltage and effect of environmental conditions on failure mechanisms, technology sector wise issues, material, design, and PCBA processing aspects in connection with humidity issues, and intrinsic and extrinsic preventive strategies.

The programme and registration information is available on the [ATV-SEMAPP website](#).



From left: lecturers Morten Jellesen and Rajan Ambat at the Corrosion Control for a Greener World course in 2023; Torben Lund Skovhus, who will be presenting at the free webinar on Biofouling and Microbiologically Influenced Corrosion



LEGAL NOTICE

European Federation of Corrosion (EFC)
 President: Prof. Tomáš Prošek
 AISBL, Avenue des Arts 56/4C, 1000 Bruxelles, Belgium
 Association No. : 0425.591.656 VAT No.: BE 0425.591.656
 E-Mail: offices@efcweb.org. Website: efcweb.org

CONTACT

Editor: Dan Mobbs → danmobbs@hotmail.com

The statements and opinions expressed in the Newsletter are those of the contributors, for which the EFC assumes no responsibility. Read our data privacy policy [here](#).