



# DECHEMA

Gesellschaft für Chemische Technik  
und Biotechnologie e.V.

## PROGRAMME AND CALL FOR POSTERS

September 19 – 21, 2012

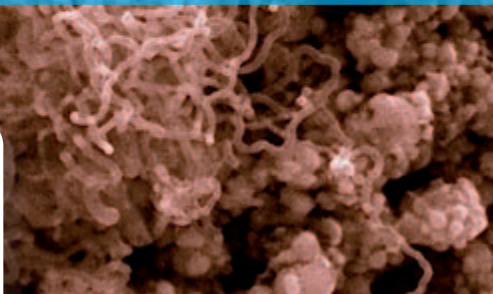
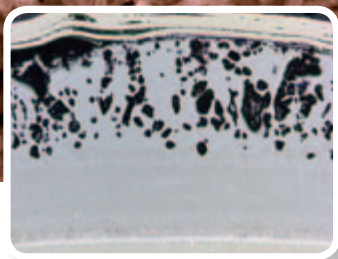
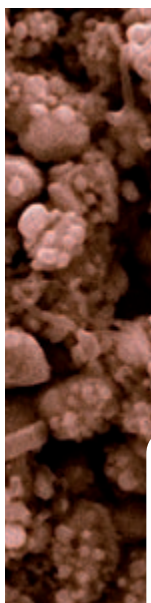
DECHEMA-Haus · Frankfurt am Main

### European Federation of Corrosion Workshop Beyond Single Oxidants



EFC-Event No. 350

[www.dechema.de/efcws12](http://www.dechema.de/efcws12)



## DECHEMA

FORSCHUNGSINSTITUT

Stiftung bürgerlichen Rechts



## INVITATION

Single oxidant situations are not often present in high temperature industrial environments. Rather, mixtures of oxygen with other species are encountered which make the high temperature corrosion situation more complex than simply the formation of a homogeneous oxide scale on the material surface. Examples of such environments include various combustion atmospheres, e.g. oxy fuel combustion, the combustion of biomass, industrial residues or domestic waste, as well as gasification environments with low oxygen partial pressures and high activities of e.g. carbon, sulphur and other constituents.

Although significant efforts have been undertaken in recent years to throw further light on such complex conditions, there still exists a considerable ambiguity and lack of understanding concerning the different mechanisms and how their interactions with one another govern the long term effects on materials. The need for further exploration in this area and for predictable component operation in such environments has significantly risen in recent years, as the intention to more efficiently use available resources has instigated increased planning to use hitherto unexploited fuels and supplies in high temperature processes.

The aim of the workshop, thus, is to review the current state of knowledge and understanding in this area of materials science and to identify the needs for future research. It will follow similar approaches of former workshops in this series of EFC events on high temperature corrosion. The workshop topic will be introduced by two overview presentations describing the research needs of industry in this area before detailed discussion of the specific aspects under multi-oxidant situations occurs in the form of oral and poster presentations. Since the year 2012 represents the 75<sup>th</sup> anniversary of the Pfeil patent on the reactive element effect the programme is complemented by two overview papers reviewing this effect for alumina and chromia formers.

All those interested in this workshop are cordially invited to attend.

Prof. Dr.-Ing. Michael Schütze,  
DECHEMA-Forschungsinstitut

Dr. Willem J. Quadackers,  
Forschungszentrum Jülich GmbH

## Wednesday, September 19, 2012

10:00	<b>Opening and introduction</b> M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D
10:15	<b>The 75<sup>th</sup> anniversary of the Pfeil patent on the reactive element effect</b>
	<b>The reactive element effect in alumina-forming alloys</b> B. Pint, Oak Ridge National Laboratory, TN/USA
	<b>What did we learn on the reactive element effect in chromia scales since Pfeil's patent?</b> S. Chevalier, University of Burgundy, Dijon/F
11:30	Coffee break
12:00	<b>Overviews on research needs in industry</b>
	<b>Research needs related to high-temperature multi-oxidant corrosion in energy conversion systems</b> P.F. Tortorelli, Oak Ridge National Laboratory, TN/USA
	<b>High temperature corrosion research needs in petroleum refining and petrochemicals industry</b> R. John, Shell International Exploration and Production Inc., Houston, TX/USA
13:00	Lunch break
14:00	<b>Gas phase corrosion in combustion environments</b>
	<b>Effect of H<sub>2</sub>O and CO<sub>2</sub> on the oxidation behaviour of steels between 400-600°C</b> B. Bordenet, H.-P. Bossmann, T. Totemeier, ALSTOM (Switzerland) Ltd., Baden/CH
	<b>Effect of SO<sub>2</sub> on oxidation of metallic materials in CO<sub>2</sub>/H<sub>2</sub>O-rich gases relevant to oxyfuel environments</b> P. Huczowski, T. Olszewski, Forschungszentrum Jülich GmbH/D; B. Lutz, University Pittsburgh, PA/USA; G. Holcomb, National Energy Technology Laboratory, Albany, OR/USA; V. Shemet, Forschungszentrum Jülich GmbH/D; G.H. Meier, University Pittsburgh, PA/USA; L. Singheiser, W.J. Quadakkers, Forschungszentrum Jülich GmbH/D
	<b>Effect of oxy-firing on corrosion rates at 600-650°C</b> B. Pint, Oak Ridge National Laboratory, TN/USA
	<b>Corrosion behaviour of Fe-Cr and Ni-Cr base alloys in atmospheres relevant to oxy-fuel combustion</b> N. Mu, K. Jung, N.M. Yanar, F.S. Pettit, University of Pittsburgh, PA/USA; P. Huczowski, T. Olszewski, Forschungszentrum Jülich GmbH/D; G.R. Holcomb, U.S. National Energy Technology Laboratory, Albany, OR/USA; L. Singheiser, W.J. Quadakkers, Forschungszentrum Jülich GmbH/D; G.H. Meier, University of Pittsburgh, PA/USA
16:00	Coffee break

## Wednesday, September 19, 2012

16:30	<b>Gas phase corrosion in combustion environments (continued)</b>
	<b>Laboratory corrosion testing of coatings and substrates under a reducing atmosphere simulating coal combustion</b> A. Agüero, M. Gutierrez, National Institute for Aerospace Technology (INTA), Torrejon de Ardoz/E; R. Muelas, INSA, Madrid/E; D. Plana, A. Roman, National Institute for Aerospace Technology (INTA), Torrejon de Ardoz/E
	<b>Oxidation of Fe, Cr and binary FeCr model alloys at 400-700°C in dry and wet oxygen</b> T. Jonsson, M. Halvarsson, L.-G. Johansson, J.-E. Svensson, Chalmers University of Technology, Göteborg/S
	<b>Influence of water vapour on the oxidation behaviour of a new thermal barrier coating system sintered from a slurry</b> F. Pedraza, M. Brossard, B. Bouchaud, Université de La Rochelle/F
	<b>Effect of nickel base superalloy composition on oxidation resistance in high pO<sub>2</sub>, SO<sub>2</sub> containing environments</b> A. Jalowicka, D. Naumenko, L. Singheiser, W.J. Quadakkers, Forschungszentrum Jülich GmbH/D
18:30	Poster Session / Dinner Buffet

## Thursday, September 20, 2012

9:30	<b>Deposits corrosion in combustion environments</b>
	<b>Designing coating compositions for extended hot-corrosion resistance</b> B. Gleeson, University of Pittsburgh, PA/USA; Z. Tang, Iowa State University, Ames, IA/USA
	<b>Type II hot corrosion: reaction kinetics for CMSX-4 and IN738LC as a function of corrosion environment</b> J. Sumner, A. Encinas-Oropesa, N.J. Simms, J.R. Nicholls, Cranfield University, Bedfordshire/UK
	<b>Protection of superheater materials from fireside corrosion by application of thermal sprayed coatings in coal/biomass co-fired power plants</b> T. Hussain, N.J. Simms, J.E. Oakey, J.R. Nicholls, Cranfield University/UK
11:00	Coffee break
11:30	<b>Deposits corrosion in combustion environments (continued)</b>
	<b>Effect of biofuel-contaminants on coated industrial gas turbines</b> A. Encinas-Oropesa, N.J. Simms, J.R. Nicholls, J.E. Oakey, Cranfield University/UK; L. Heikinheimo, S. Tuurna, VTT Industrial Systems/FIN
	<b>The influence of heavy metals in chloride and sulphate deposits on the corrosion of boiler tubes in waste-to-energy plants</b> J. Bauer, DECHEMA-Forschungsinstitut, Frankfurt am Main/D; M. Noguchi, H. Cho, C. Takatoh, Ebara Corp., Tokyo/J; M. Schütze, M. Galetz, DECHEMA-Forschungsinstitut, Frankfurt am Main/D
	<b>Corrosion resistivity of different steel grades against potassium salts under conditions relevant to biomass combustion</b> J. Lehmusto, P. Yrjas, B.-J. Skrifvars, M. Hupa, Åbo Akademi University, Turku/FIN
13:00	Lunch break
14:00	<b>High temperature corrosion in non-combustion energy conversion environments</b>
	<b>Localized oxidation in zirconium alloys in high temperature and pressure oxidizing environments of nuclear reactor</b> K. Mandapaka, V. Kain, Bhabha Atomic Research Centre, Mumbai/IND
	<b>Oxidation of zirconium alloys in mixed atmospheres containing nitrogen</b> M. Steinbrück, Karlsruhe Institute of Technology/D
	<b>Selective oxidation of chromium by O<sub>2</sub> impurities in CO<sub>2</sub> during initial stages of oxidation</b> S. Bouhieda, F. Rouillard, CEA Saclay, Gif sur Yvette/F; V. Barnier, K. Wolski, ENSM SE, Saint Etienne/F
	<b>Effects of water vapour on the high temperature nitridation of chromium</b> M. Michalik, University of New South Wales, Sydney/AUS; M. Hänsel, V. Shemet, W.J. Quadackers, Forschungszentrum Jülich GmbH/D; D. Young, University of New South Wales, Sydney/AUS
16:00	Coffee break

## Thursday, September 20, 2012

16:30	<b>High temperature corrosion in non-combustion energy conversion environments (continued)</b>
	<b>Deactivation of graphite supported nano-silver for application of direct borohydride/peroxide fuel cells</b> A. Aytac, Gazi University, Ankara/TR; A.E. Sanli, Turgut Ozal University, Ankara/TR
	<b>Corrosion of stainless steels and low-Cr steel in CSP plants by binary and ternary molten nitrate mixtures developed by DSC</b> A. Fernandez, I. Lasanta, F.J. Pérez, Universidad Complutense de Madrid/E
	<b>High temperature corrosion beneath nitrate melts</b> M. Spiegel, J. Mentz, Salzgitter Mannesmann Forschung GmbH, Duisburg/D
18:00	Poster Session / Dinner Buffet

## Friday, September 21, 2012

9:30

## High temperature corrosion in process industry environments

**High temperature corrosion of Hastelloy-X in various carbon containing atmospheres**  
 S. Hayashi, C. Matsukawa, K. Kaya, S. Ukai, Hokkaido University, Sapporo/J; H. Yakuwa, T. Kishikawa, Ebara Corporation, Futtsu/J

**Materials challenges in cyclic carburizing and oxidizing environments for petrochemical applications**

C.M. Chun, S. Desai, F. Hershkowitz, ExxonMobil Research and Engineering Company, Annandale, NJ/USA; T.A. Ramnarayanan, Princeton University, NJ/USA

**Influence of interdiffusion zones on the performance of coatings against metal dusting**

C. Geers, M. Galetz, M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D

11:00 Coffee break

11:30

## High temperature corrosion in process industry environments (continued)

**Kinetic aspects of high temperature chlorine corrosion**

M. Galetz, B. Rammer, M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D

**AlN formation in high aluminum content Fe-Al alloys**

J. Bott, Carnegie Mellon University, Pittsburgh, PA/USA; H. Yin, ArcelorMittal Global R&D, East Chicago, IN/USA; S. Sridhar, Carnegie Mellon University, Pittsburgh, PA/USA

**Development of diffusion coatings to improve the oxidation behavior of reformer materials in water vapor containing atmospheres**

A. Naji, M. Galetz, M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D

13:00 Poster award and closure of the workshop

W.J. Quadackers, Forschungszentrum Jülich GmbH/D

13:15 Lunch and end of the workshop

**P01 Effect of aluminizing and chromizing on the corrosion of steels at 600-800 °C in N<sub>2</sub>-H<sub>2</sub>S-H<sub>2</sub>O gases**  
 M. Kim, Sungkyunkwan University, Suwon/ROK; J. Doh, KIST, Seoul/ROK; D. Lee, Sungkyunkwan University, Suwon/ROK

**P02 Oxidation of sintered Si<sub>3</sub>N<sub>4</sub> + 1,5% MgO in atmospheres containing sulphur at temperatures 1073-1273 K**  
 Z. Zurek, Cracow University of Technology/PL; J. Jedlinski, A. Gil, AGH University of Science and Technology, Krakow/PL; A. Wyczesany, K. German, Cracow University of Technology/PL

**P03 Oxidation resistance of near-alpha Ti-based alloys and their coatings**  
 H. Murakami, Y. Yamabe-Mitarai, D. Ping, T. Kitashima, S. Wu, W. Xiao, R. Zempo, National Institute for Materials Science, Tsukuba/J

**P04 Corrosion-resistant coatings for refractory lining anchors in aggressive high temperature environments**  
 J. Bauer, M. Galetz, M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D

**P05 Behaviour at high temperature corrosion of ferritic alloys beneath chlorides in different atmospheres**  
 M. Sanchez Pasten, J. Blancas Blancas, J.A. Alcantara Gutierrez, J.F. Chavez Alcalá, Instituto Politecnico Nacional, Mexico City/MEX

**P06 Numerical analysis of high temperature internal corrosion mechanisms by the finite difference and the cellular automata approach**  
 K. Jahns, M. Landwehr, J. Wübbelmann, U. Krupp, University of Applied Sciences, Osnabrück/D

**P07 Improvement of oxidation behavior of ferritic-martensitic steels in water vapor containing environments via diffusion coatings**  
 D. Schmidt, M. Galetz, M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D

**P08 In situ observation of breakaway oxidation in the early stage of steam oxidation of austenitic steel at 973 K**  
 A. Okubo, M. Ueda, K. Kawamura, M. Takeyama, T. Maruyama, Tokyo Institute of Technology/J

**P09 Application of defect based scale failure diagrams to oxide layers grown in humid and dry atmospheres**  
 M. Rudolphi, M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D

**P10 Sulfidation behavior of non harmful water based Al and Al-Si slurry coated CM247 Superalloy**  
 X. Montero, M. Galetz, M. Schütze, DECHEMA-Forschungsinstitut, Frankfurt am Main/D

**P11 Texture formation in chromia scales grown on chromium in wet and dry Ar-1%O<sub>2</sub> at high temperatures**  
 M. Hänsel, V. Shemet, E. Wessel, Forschungszentrum Jülich GmbH/D; B. Gorr, H.-J. Christ, University of Siegen/D; L. Singheiser, W.J. Quadackers, Forschungszentrum Jülich GmbH/D

**P12 Fireside corrosion of nickel base alloys in conventional and oxyfuel firing conditions**  
 G. Stein-Brzozowska, D.M. Flórez, J. Maier, G. Scheffknecht, University of Stuttgart/D; P. Huczowski, L. Singheiser, W.J. Quadackers, Forschungszentrum Jülich GmbH/D

**P13 Corrosion processes of interconnect steels at the anode side of hydrocarbon powered solid oxide fuel cells at 600°C**  
 L. Niewolak, C. Asensio, T. Hüttel, W.J. Quadackers, Forschungszentrum Jülich GmbH/D

## GENERAL INFORMATION

### SUBMISSION OF POSTERS

The submission of one-page abstracts for last minute posters is still possible until **17 August 2012**.

For detailed information and submission please see

[www.dechema.de/efcws12](http://www.dechema.de/efcws12)

The selection of the posters will be based on the review of the submitted one-page abstracts by a scientific committee. Authors will be informed about the acceptance in August 2012. These posters will be announced online and in the book of abstracts being available at the Workshop.

### POSTER PRIZE

The poster prize is awarded in recognition of an outstanding poster presentation. The scientific committee will select two posters for an award of EUR 250 each.

### PUBLICATION

Refereed contributions will be published after the Workshop in a special issue of the journal *Materials and Corrosion*. Authors who wish to submit their contributions for publication are requested to deliver their manuscripts by **18 September 2012**. Instructions for the preparation of the manuscripts can be found on the website [www.dechema.de/efcws12](http://www.dechema.de/efcws12). The manuscripts should be sent to Ms C. Steinmetz, E-mail: [gfkorr@dechema.de](mailto:gfkorr@dechema.de).



## GENERAL INFORMATION

### VENUE

DECHEMA-Haus  
Theodor-Heuss-Allee 25  
60486 Frankfurt am Main  
Germany

### CONGRESS ADMINISTRATION

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60486 Frankfurt am Main / Germany  
Phone: +49 69 75 64-152  
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E-mail: [wu@dechema.de](mailto:wu@dechema.de)

### WORKSHOP LANGUAGE

The workshop language is English.

### CONFERENCE FEE

The conference participation fee is EUR 440.  
(No VAT requested acc. to § 4.22 UStG)

The conference ticket includes the book of abstracts, list of participants, meals and beverages during the coffee and lunch breaks and in the evenings.

### REGISTRATION

Registration should be made online at [www.dechema.de/efcws12](http://www.dechema.de/efcws12)

In general there is no registration deadline as long as free capacity is available. Confirmation of registration and the invoice will be sent on receipt of the registration by postal mail.

**Please note:** Publication deadline of the list of participants is **August 31, 2012**. There is no guarantee that registrations received thereafter will appear in the list.

### PAYMENT

Due to organisational reasons we only accept online registration and payment by credit card. We ask you for your understanding.

## GENERAL INFORMATION

### CANCELLATION AND REFUNDS

EUR 30 administrative costs will be charged for cancellations made before **August 31, 2012**. Thereafter 80% of the conference fee will be invoiced, however, the book of abstracts will be sent. Cancellation must be made in writing (letter, fax or e-mail).

If the event is cancelled by DECHEMA, the whole fees will be refunded. Further claims for compensation are excluded.

### ACCOMMODATION

#### Hotel Tryp Frankfurt

Katharinenkreisel (Opelrondell)

60486 Frankfurt am Main

Phone: +49 69 707 30-500

Fax: +49 69 707 30-333

E-mail: [reservierung.frankfurt@tryp-deutschland.de](mailto:reservierung.frankfurt@tryp-deutschland.de)

Single room: EUR 87 per night incl. breakfast and taxes

(3 min by bus line 50, departure directly in front of the hotel every 15 min)

#### Mercure Hotel & Residenz

Voltastr. 29

60486 Frankfurt am Main

Phone: +49 69 7926-2706

Fax: +49 69 7926-2707

E-mail: [h1204-re5@accor.com](mailto:h1204-re5@accor.com)

Single room: EUR 92 per night incl. breakfast and taxes

(10 to 15 min walk.)

Accommodation has been reserved for conference participants at a special rate in the aforementioned hotels. Reservations should be made directly with the hotel by the participant using the keyword **EFC-WS2012** by **August 21, 2012**.

## GENERAL INFORMATION

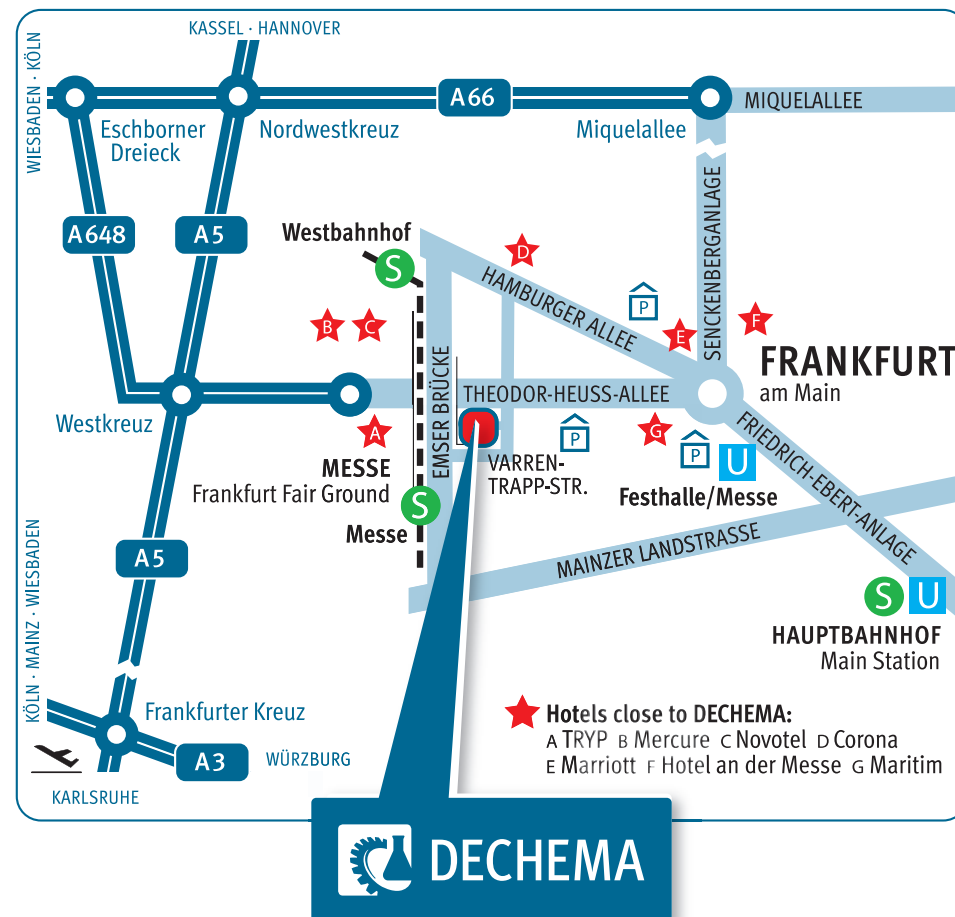
### HOW TO GET TO DECHEMA

For detailed route description please check

[www.dechema.de/location](http://www.dechema.de/location)

Parking spaces at DECHEMA are limited. Please use the multistorey car parks along Theodor-Heuss-Allee, e. g. Congress-Center-Messe (CMF) or Messeturm. Both are located in the direction of the city.

**PLEASE NOTE:** The area of DECHEMA is part of the low emission zone in Frankfurt ([www.umweltzone.frankfurt.de](http://www.umweltzone.frankfurt.de)). Only vehicles displaying an appropriate badge on their windscreen will be allowed to enter the low emission zone.







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