



EUROPÄISCHE FÖDERATION KORROSION  
EUROPEAN FEDERATION OF CORROSION  
FEDERATION EUROPEENNE DE LA CORROSION

## **EFC Working Party 5 Environment Sensitive Fracture**

**Krzysztof WOLSKI** appointed in 2009

Département Mécanique Physique et Interfaces (UMR CNRS 5146 PECM)

Centre SMS, Ecole Nationale Supérieure des Mines de St-Etienne

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**Vigdis OLDEN** appointed in 2010

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## Welcome

The EFC is a federation of over 30 societies with interests in corrosion based in twenty-five different countries within Europe and beyond. Taken together, its member societies represent the corrosion interests of more than 25,000 engineers and scientists.

Its aim is to advance the science of the corrosion and protection of materials by promoting cooperation in Europe and collaboration internationally. [[more...](#)]

### EFC Events

#### EUROCORR 2013

Corrosion Control for a Blue Sky

Estoril, Portugal

Sep 01, 2013 - Sep 05, 2013

#### 6th Kurt Schwabe Symposium

Surface analysis and material engineering in corrosion science and electrochemical technologies

Cracow, Poland

Sep 16, 2013 - Sep 19, 2013



### EUROCORR 2013

Estoril, Portugal, 1-5 September 2013

#### NEW:

- Plenary Lectures
- Graduate Course

EFC Newsletter No 21

September 2013

E-Newsletter April 2013

September 2012:

Lorenzo Fedrizzi elected as EFC President

## EFC WORKING PARTY 5: ENVIRONMENT SENSITIVE FRACTURE

WP5's overall objective is to bring together scientists and engineers encountering the problem of crack initiation and propagation in different application fields including nuclear, petrochemical and aeronautical industries. In such environments fracture often results from a simultaneous action of mechanical loading and aggressive environment which can be either water or hydrogen or reactive gases or even more specific like liquid metal. The common feature requested for accurate prediction of the remaining lifetime is the need to understand the mechanisms of crack initiation and crack propagation.

WP5 specific missions concern the fields of hydrogen induced cracking, stress corrosion cracking, fatigue-corrosion, high temperature corrosion and liquid metal embrittlement and are aimed at

- confronting physico-chemical and mechanical approaches in modelling environment sensitive fracture,
- promoting the use of advanced local investigation methods (AFM, EBSD, Auger/XPS, nanomechanical testing) for submicrometer range description of crack initiation sites and crack-tip characteristics and
- promoting the use of numerical simulations based on multiscale physical approach.
- contributing to the definition of recommendations through joint sessions with colleagues from different application fields.



**Chairman:**

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**If you wish become involved in the activities of the WP 5 on Environmental Sensitive Fracture please visit our homepage to register online under:**

**<http://www.efcweb.org/Working+Parties/WP+5>**

**If you wish get involved in the activities of the WP on Environmental Sensitive Fracture please click here to register!**



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## Service for members

The following pages are restricted to EFC Member Societies, members of the Board of Administrators (BoA) and members of the Science and Technology Advisory Committee (STAC), respectively.

Please use your username and password to login.

[Service for Member Societies](#)

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# EUROCORR 2009

**WP5: Environment Sensitive Fracture**

**Acting chairman Krzysztof Wolski ([wolski@emse.fr](mailto:wolski@emse.fr))**

**WP5 under its recently appointed acting chairman organized a session on Environment Sensitive Fracture at EUROCORR 2009. This included 10 oral presentations and 3 posters.**

**WP5's overall objective is to bring together scientists and engineers encountering the problem of crack initiation and propagation in different application fields including nuclear, petrochemical and aeronautical industries. In such environments fracture often results from a simultaneous action of mechanical loading and aggressive environment which can be either water or hydrogen or reactive gases or even more specific like liquid metal. The common feature requested for accurate prediction of the remaining lifetime is the need to understand the mechanisms of crack initiation and crack propagation.**



**Vigdis Olden appointed as co-chairman ([olden@sintef.no](mailto:olden@sintef.no))  
Organisation of WP5 session in Moscou with participation of  
approximately 50 persons, 10 oral presentations and 4 posters**

### **WP5 business meeting : 25 personnes**

**WP5 specific missions concern the fields of hydrogen induced cracking, stress corrosion cracking, fatigue-corrosion, high temperature corrosion and liquid metal embrittlement and are aimed at**

- confronting physico-chemical and mechanical approaches in modeling environment sensitive fracture,**
- promoting the use of advanced local investigation methods (AFM, EBSD, Auger/XPS, nanomechanical testing) for submicrometer range description of crack initiation sites and crack-tip characteristics and**
- promoting the use of numerical simulations based on multiscale physical approach.**
- contributing to the definition of recommendations through joint sessions with colleagues from different application fields.**

**2010 / 2011**

**Contribution to the book :  
“Nuclear corrosion science and engineering”**

**Chapter 5 “Environmentally Assisted Cracking”**

5.1 Introduction

5.2 Basic principles of EAC

5.3 Alloys and components exposed to EAC in nuclear industry

5.4 Models and mechanisms of EAC

5.5 Future trends : from experimental approach to numerical simulations

5.6 Sources of further information

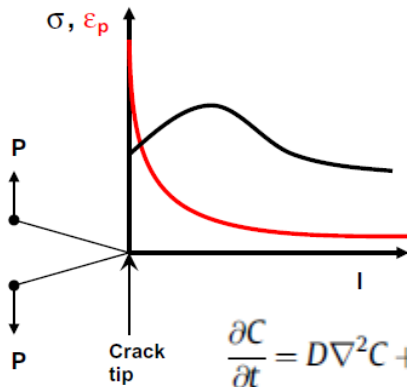
5.7 References

Editor: Dr Damien Féron, Commissariat à l’Energie Atomique, CEA Saclay,  
DPC/SCCME, France

**Published in 2012 by Woodhead Publishing**

# EUROCORR 2011

Organisation of WP5 session in Stockholm with participation of approximately 40 persons, 11 oral presentations and 5 posters



Cohesive zone simulation of cold cracking susceptibility in a hyperbaric weld of X70 structural steel

V. Olden et al., SINTEF Materials and Chemistry, Trondheim/N;

$$\frac{\partial C}{\partial t} = D \nabla^2 C + D \cdot \frac{V_H}{R \cdot (T - T^Z)} \nabla C \cdot \nabla p + D \cdot \frac{V_H}{R \cdot (T - T^Z)} C \nabla^2 p$$

Modeling environmentally assisted cracking : review of main ingredients as a function of temperature

Krzysztof Wolski  
Département Mécanique Physique et Interfaces (UMR CNRS 5146 PECCM)  
Centre SMS, Ecole Nationale Supérieure des Mines de Saint-Etienne  
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AIM  
To underline the importance of both metallurgical and environmental parameters in assessing Environmentally Sensitive Fracture  
To introduce the discussion during WP5 business meeting about the objectives of ESF session

PLAN  
Introduction  
1<sup>st</sup> Example of industrially relevant cracking (304H, 600°C)  
2<sup>nd</sup> Example of liquid metal induced embrittlement (Al-Bi)  
3<sup>rd</sup> From diffusion with trapping to Cohesive Zone Model  
4<sup>th</sup> Advanced experimental studies at a nanometer scale  
Conclusion

Eurocorr 2011, Stockholm, SWEDEN 4-8 September 2011

Modeling environmentally assisted cracking: review of main ingredients as a function of temperature

K. Wolski, École Nationale Supérieure des Mines de Saint-Etienne/F

WP5 business meeting : 15 personnes



# EUROCORR 2012

Organisation of WP5 session in Istanbul with participation of approximately 40 persons, 11 oral presentations and 5 posters

## Workshop on occurrence and mechanisms of Environmentally Assisted Cracking

First announcement



A common workshop during Eurocorr'2012, Istanbul, Turkey, 9-13/09/2012

co-organized by :

- WP 4 "Nuclear Corrosion"
- WP 5 "Environmentally sensitive fracture"
- WP 9 "Marine Corrosion"
- WP 13 "Corrosion in Oil & Gas"
- WP 15 "Corrosion in the Refining Industry"
- WP 17 "Automotive corrosion"

WP5 business meeting : 20

WS in environmentally assisted cracking

J. Kittel/K. Wolski

Keynote

T. Cassagne

U. Kivisäkk

V. Olden

C. Bosch

WS in environmentally assisted cracking

V. Olden/D. Feron

Keynote

P. Combrade

T. Couvant

J. Bouhattate

WS in environmentally assisted cracking

T. Couvent/C. Powell

R. Rebak

N. Lorho

S. Ritter

K. Wolski

# EUROCORR 2013

<http://eurocorr2013.org/>

**EUROCORR 2013**  
for a blue sky



**EUROPEAN CORROSION CONGRESS**  
The annual event of the European Federation of Corrosion



September 1 - 5, 2013 • Estoril Congress Center • Estoril, Portugal

**Conference Info**

- Introduction
- General Information
- About Estoril
- Committees
- Important Dates
- Congress Programme
- Plenary Lectures
- Scientific Sessions
- Meetings
- Instructions for Authors
- Full Manuscript Submission
- Registration
- Accommodation
- Official Airline Network
- Graduate Course
- NACE MR0175/ISO15156
- Exhibitors & Sponsors



Introduction

EUROCORR is the most important event in Europe and a reference around the world on the subjects of corrosion and protection.

Welcome to Estoril!!

**Organisation of WP5 session in Estoril with participation of approx 30-50 persons, 17 oral presentations and 5 posters**  
**Keynote lecture by prof. Xavier Feaugas**

## Keywords

- Hydrogen diffusion and embrittlement
- Electrochemistry and Stress Corrosion Cracking
- From fundamental approach to industrial case studies

WP5 business meeting : 8 persons

Room 7-D1+D2 70
Environment Sensitive Fracture
<b>K. Wolski</b>
1193 B. O. Hoch
1630 F. Vucko
1530 A. Oudriss
1243 J. Sobetzki
1152 A. Keserovic
Environment Sensitive Fracture
<b>H. Hoffmeister</b>
1230 K. Wolski
1080 K. Gao
1688 G. Mori
1280 R. B. Rebak
Environment Sensitive Fracture
<b>J. Bouhattate / X. Feaugas</b>
1037 S. Funani
1077 T. Haruna
1739 R. Rihan
1535 A. Girones
1520 Proverbio
1514 Blanc

Room 7-D1+D2 70
Environment Sensitive Fracture
<b>K. Wolski / J. Bouhattate</b>
1478 X. Feaugas
1478 X. Feaugas
1067 H. Hoffmeister
Business meet
Business meet

# EUROCORR 2014

<http://eurocorr2014.org/>



Organisation of WP5 session in Estoril with participation of approximately XX persons, 15 oral presentations

## Highlights

- Authors from 10 different countries
- No poster presentations

WP5 business meeting :

Joint Session of EFC WP 5 Environmental Sensitive Fracture & WP 18 Tribocorrosion EUROCORR 2014, Pisa, Italy

Room 2
Environment Sensitive Fracture
<i>K. Wolski</i>
7490 C. Evans
7512 R. Pettersson
7210 C. Berne
7074 R. Bogdanov
break
Environment Sensitive Fracture
<i>C. Evans</i>
7271 W. Huang
7806 A. Atrens
7391 E.F. Turcu
7446 D. Bangsgaard
7586 C. Dellabiancia
lunch
Environment Sensitive Fracture
<i>A. Visser / C. Blanc</i>
7523D. Di Pietro
7688 I. Proriot Serre
7235 J. Sobetzki
7605 A. Visser
7829 L. Qiao
break
Environment Sensitive Fracture
<i>K. Wolski</i>
7151 K. Wolski
WP 5 business meeting

Room 4
JS I: Surface and Bulk Degradation
<i>M. Keddam / P. Ponthiaux</i>
7528 B. Normand
7532 N. Mary
7630 T. Kosec
7798 M. Keddam
break
JS I: Surface and Bulk Degradation
<i>M. Keddam / P. Ponthiaux</i>
7687 I. Proriot Serre
7772 F. Pagano

# EUROCORR 2015

<http://eurocorr2015.org/>



ASMET, the Austrian Society for Metallurgy and Materials, is proud to host the **European Corrosion Congress EUROCORR 2015**. The conference will take place in **Graz** at the Stadthalle, from **6-10 September 2015**.

## Joint Session among WP13, WP9 and WP5 Corrosion in Oil and Gas Production, Marine Corrosion and Environmentally Sensitive Fracture

Second announcement



Common session during Eurocorr'2015, Gratz, Austria, 06-10/09/2015

The aim of this common session is to bring together academics and industrials concerned with two issues that have recently become of outer importance:

- issues regarding HISC of duplex stainless steels such as easier qualification tests and design rules
- corrosion and cracking of Ni-based alloys in deep water oil&gas exploration

*Both issues are related to cathodic charging of materials in seawater that can result in hydrogen induced cracking. Recently it has been evident that hydrogen embrittlement of precipitation hardening Ni-base alloys can occur and contributions regarding this phenomenon including results from test programs and the mechanism are welcome. For HISC there have been guidelines rules present for several years which may be updated. Contributions can cover improved qualification test methods and design criterions as well as mechanistic work are invited.*

## Other issues :

- WP5 members list to be updated
- Possibility to organise EFC events
- Any question / suggestion from delegates



**EUROCORR 2014**  
EUROPEAN CORROSION CONGRESS

8-12 September 2014  
Pisa · Italy

SCOPE	CALL FOR PAPERS	EXHIBITION	VENUE	ORGANISERS
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**SCOPE**

**Associazione Italiana di Metallurgia – AIM** will host **EUROCORR 2014**, the 365th event of the European Federation of Corrosion - EFC, which will be held in Pisa, Italy, from 8 - 12 September 2014.

This premier event on Corrosion, will return to the same Latin land - Italy - where Plinius the Old for the first time coined the phrase "*ferrum corrumpitur*".

Scope of the Congress is to present the state-of-the-art in the fields of corrosion and protection of materials, both from a technical-scientific as well as from a practical application perspective, starting from those used in the past to the ones destined to modern industry. The event is meant to foster the transfer information of and experiences among researches and operators in the fields of corrosion and to benefit from information, collaboration and common enrichment.

organised by



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EUROCORR 2014