



DECHEMA

Gesellschaft für Chemische Technik
und Biotechnologie e.V.

PROGRAMME

25 – 28 June 2017

Friedrichshafen/Lake Constance · Germany

ICSHM 2017

6th International Conference on Self-Healing Materials

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#icshm2017

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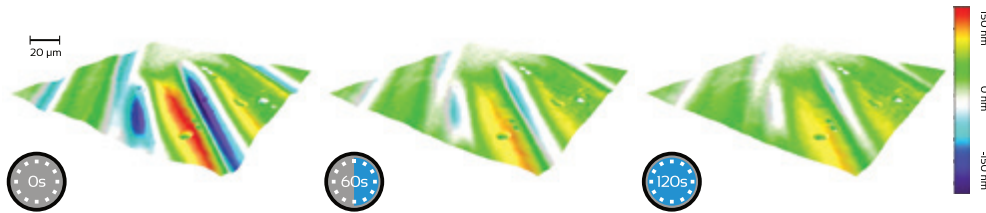
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- Thermodynamics parameters : pressure, temperature
- Surrounding gas and liquid : deposition, corrosion
- Mechanic and electromagnetic forces
- Light irradiance

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COMMITTEES

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Marek Urban	Clemson University/USA
Scott White	University of Illinois/USA
Ming Qiu Zhang	Zhongshan University/PRC

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Barbara Feisst	DECHEMA e.V., Frankfurt am Main/D
Björn Mathes	DECHEMA e.V., Frankfurt am Main/D
Chereén Semrau	DECHEMA e.V., Frankfurt am Main/D

WELCOME ADDRESSES

Dear Self-Healing Materials Community, dear Colleagues,

We are proud to welcome you to the 6th International Conference on Self-Healing Materials (ICSHM2017) and to share with you the exciting new developments in our scientific area.

We deeply appreciate the generous sponsorship and support of Evonik Industries AG, the Netherlands Enterprise Agency (RVO), Fonds der Chemischen Industrie (FCI) and the German Research Foundation (DFG).


The field of self-healing materials has seen a dramatic evolution in Europe with emerging cross-fertilization among the various areas of Materials Sciences linking a significant number of research laboratories in high profile scientific networks and projects. The programme of the 6th ICSHM shows again that this conference series serves as a platform for exchanging ideas and acquiring new impulses as well as to welcome friends and colleagues from all around the world, to provide a showcase for self-healing materials and to tighten the multiple global interactions. ICSHM2017 will not only reflect mechanisms, materials, characterisation and processes but also the huge potential of self-healing materials in all application areas. It will be structured in four main streams: *“Soft Matter Self-healing Materials”*, *“Hard Matter Self-healing Materials”*, *“Self-healing Materials in Industrial Applications”* and *“Characterisation and Application”*.

The exciting programme of ICSHM2017 offers 113 presentations from 20 countries, including 8 keynote presentations and 4 plenary presentations from renowned scientists from all over the world. The 60 posters will be highlighted in the great poster session on Monday evening.

Our host city Friedrichshafen on Lake Constance offers a mixture of a flourishing economic, tourist and living region. At Lake Constance, potentials and resources from four highly developed countries – Germany, Austria, Switzerland and Liechtenstein – come together here and form one of the most dynamic economic regions in Europe. Our event facility – the Graf-Zeppelin-Haus – is situated right next to the marina and the lakeside promenade and also well connected to the city centre of Friedrichshafen allowing one to enjoy this lively city on Lake Constance and to experience the special spirit of the four-country region around Lake Constance in a most personal way.

We hope you enjoy your stay at ICSHM 2017!

Sincerely,


Prof. Wolfgang H. Binder
Chairman
Executive Organising Committee
ICSHM 2017


Prof. Ulrich S. Schubert
Chairman
Executive Organising Committee
ICSHM 2017

GREETING ADDRESSES



Greeting address by Christoph Weder, University of Fribourg/CH

Materials that self-heal or can be healed after sustaining damage have the potential to improve the reliability, functionality, and lifetime of many products. During the last decade, research and development efforts in this domain have afforded spectacular progress. The 6th International Conference on Self-Healing Materials is a unique opportunity to share and receive up-to-date information on the state of the field and I look very much forward to participate in this event.



Greeting address by Scott White, University of Illinois at Urbana-Champaign/USA

I am tremendously excited to attend the 6th International Conference on Self-Healing Materials (ICSHM 2017). This meeting is auspicious since it occurs a full decade after the inaugural meeting in Noordwijk, The Netherlands in 2007. Much progress has been made across a broad spectrum of materials systems over that 10-year period. I look forward with anticipation to hear from my colleagues in our self-healing community on the most recent advances both scientifically and technically. Lest we forget an important aspect of these biennial gatherings, I also looking forward to rekindling friendships and collaborations within the social setting that the conference will provide. See you soon in Friedrichshafen!



Greeting address by Erik Schlangen, TU Delft/NL

For some people Self-Healing or Smart Materials may still seem as kind of magic, but they carry the very real potential to change our roads, buildings and means of transportation. If you attend the 6th ICSHM we will provide you with evidence by showing real applications.



Greeting address by Fátima Montemor, Universidade Técnica de Lisboa/P

The use of organic coatings for corrosion protection has been a dynamic and evolving field with many breakthroughs achievements over the last years – self healing coatings are at the edge and will continue evolving over the next years. The number of publications is growing almost exponentially, as well as the number of events dedicated to the topic. Presently, conferences dealing with coatings, polymers or materials must give dedicated attention to the self-healing topic as it always attract relevant attention and a growing number of papers.



Greeting address by Hideyuki Otsuka, Tokyo Institute of Technology/J

Most of current polymeric engineering materials have been developed on the basis of a passive “dam-age prevention” paradigm to prevent the cleavage of irreversible covalent bonds for enhancing the mechanical and thermal properties of the materials. In contrast, self-healing and self-reporting polymers can be designed based on a unique active “damage management” concept, where the damage to the materials can not be avoided but can be detected and repaired before the materials fail.

GREETING ADDRESSES



Greeting address by Ming Qiu Zhang, Sun Yat-sen University/CN

“Healed up without any treatment” (不药而愈, bù yào ér yù)

An idiom widely used in Chinese community, passes the good wish of mankind for those suffering from psychological disturbances or surgical trauma.



Greeting address by Wim G. Sloof, Delft University of Technology/NL

I am looking forward meeting you at the 6th International Conference on Self-Healing Materials in Ger-many. Since the concept of self-healing materials becoming more and more established, you may expect a status report on self-healing ceramics. New developments and emerging applications will be shown. Enjoy your stay at this great conference in Friedrichshafen Germany.



Greeting address by Sander Leeuwenburgh, Radboud University, Nijmegen/NL

What a privilege it is to be part of the community of self-healing materials scientists! During the past decade we have witnessed the emergence of self-healing materials, and now we are all experiencing the rapid maturation of this field towards practical applications that will benefit society at large. I am highly excited to share with you our most recent work on self-healing composites for regenerative medicine, and I look forward to an exciting meeting in Friedrichshafen



GOOD TO KNOW

WIFI

Network: free key GZH

VENUE ADDRESS

Graf-Zeppelin-Haus Friedrichshafen
Olgastr. 20
88045 Friedrichshafen

CONFERENCE OFFICE

Barbara Feisst
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OFFICE HOURS

Sunday, 25 June 9:00 – 20:30
Monday, 26 June 8:00 – 19:00
Tuesday, 27 June 8:30 – 17:00
Wednesday, 28 June 8:00 – 17:30

PHOTOGRAPHY

The use of cameras, video cameras, and cell phone photography is prohibited during programme sessions or in the poster exhibition.

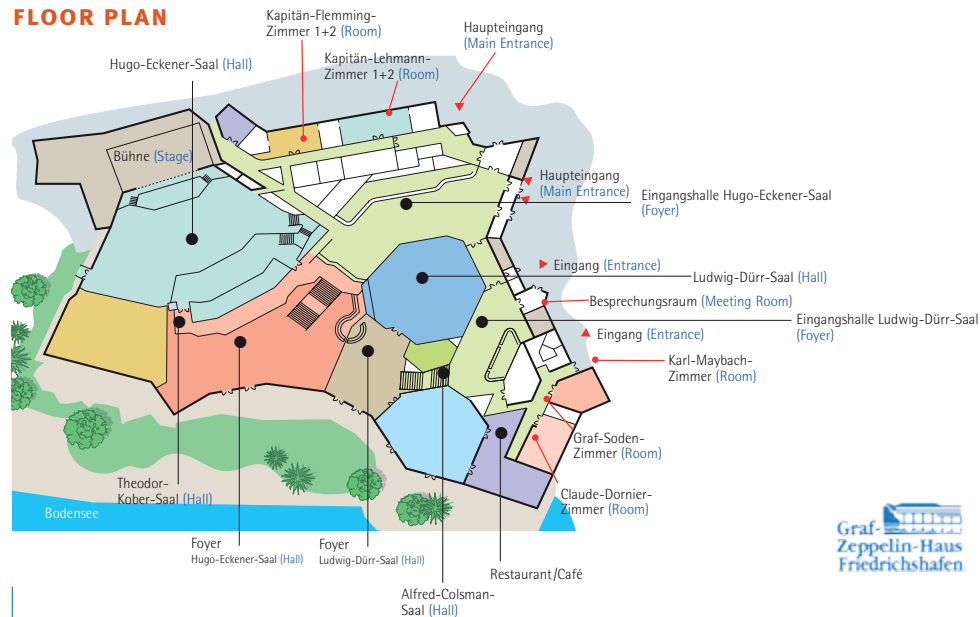
NAME BADGES

All participants are kindly requested to wear their name badges throughout the conference. In case you lost your badge, a new one will be available at the conference office.

SMOKING

Smoking is prohibited inside the venue. You are kindly requested to smoke outside the building where ashtrays are available for your convenience.

FLOOR PLAN



PLENARY LECTURES / KEYNOTE LECTURES

PLENARY LECTURES

Monday, 26 June, 9:15 – 10:00

Ludwig-Dürr-Saal



The Long and Treacherous Road to Commercialisation: Self-Healing Comes of Age
Scott White, University of Illinois at Urbana-Champaign, Urbana/USA

Tuesday, 27 June, 8:30 – 9:20

Ludwig-Dürr-Saal



Bacteria-based self-healing concrete – from lab table to full scale application
Henk Jonkers, TU Delft/NL

Wednesday, 28 June, 8:30 – 9:20

Ludwig-Dürr-Saal



Healable Supramolecular Polymers
Christoph Weder, University of Fribourg/CH

Wednesday, 28 June, 13:20 – 14:10

Ludwig-Dürr-Saal



Self-Healing of Polymers and Beyond
Marek Urban, Clemson University/USA

KEYNOTE LECTURES

Monday, 26 June, 10:30 – 11:20

Ludwig-Dürr-Saal



Faster, Higher, Stronger: Development of Self-Healing Polymeric Materials towards a Sustainable World
Ming Qiu Zhang, Zhongshan University/PRC

Monday, 26 June, 13:20 – 14:10

Alfred-Colsman-Saal



Self-healing of ceramics for high temperature applications
Wim Sloof, Delft University of Technology/NL

Monday, 26 June, 15:30 – 16:20

Theodor-Kober Saal



Self-healing coatings for advanced corrosion protection strategies: Where are we?
Fatima Montemor, IST – Instituto Superior Tecnico, Lisboa/P

KEYNOTE LECTURES

KEYNOTE LECTURES

Tuesday, 27 June, 9:20 – 10:10

Ludwig-Dürr-Saal



Self-healing and Mechanochromic Polymers with Dynamic Covalent Bonds

Hideyuki Otsuka, Tokyo Institute of Technology/JJP

Tuesday, 27 June, 11:00 – 11:50

Alfred-Colsman-Saal



Self-Healing Asphalt: From Laboratory to Field Test and back to the Lab

Erik Schlangen, Delft University of Technology, Delft/NL

Tuesday, 27 June, 13:20 – 14:10

Theodor-Kober Saal



Self-healing composites for bone regeneration

Sander Leeuwenburgh, Radboud University, Nijmegen/NL

Wednesday, 28 June, 9:20 – 10:10

Ludwig-Dürr-Saal



Mechanochemical routes to self-healing polymers

Stephen Craig, Duke University, Durham/USA

Wednesday, 28 June, 11:00 – 11:50

Theodor-Kober Saal



Healing impact damage in fiber reinforced composite structures

Véronique Michaud, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne/CH



We're often asked exactly what part we play in tomorrow's pioneering products. It's the pioneering part.

Evonik is the creative industrial group from Germany. Our experts draw on their wealth of ideas coupled with years of experience and specialty chemicals know-how to develop responsible solutions for tomorrow – from lightweight construction to new display technologies. Creavis, our strategic innovation unit, is a visionary driving force opening up new opportunities for our customers. And happily also for you. Visit the future at www.creavis.com.

PROGRAMME AT A GLANCE

Monday, 26 June 2017

8:00	Registration		
	Ludwig-Dürr-Saal		
9:00	Conference Opening		
9:15	PLENARY LECTURE White		
10:00	COFFEE BREAK		
	Ludwig-Dürr-Saal	Alfred-Colsman-Saal	Theodor-Kober-Saal
	Soft matter self-healing materials 1	Characterisation and modelling 1	Application of self-healing materials 1
10:30	KEYNOTE LECTURE M. Zhang	Versteylen	Post
10:55		Yamamoto	Cohades
11:20	Lloyd	Krishnasamy	Bond
11:45	Michael		Burke
12:05	LUNCH		
	Soft matter self-healing materials 2	Hard matter self-healing materials 1	Application of self-healing materials 2
13:20	Döhler	KEYNOTE LECTURE Sloof	Diaz Acevedo
13:45	Zhong		Nassho
14:10	Van Herck	J. Zhang	Mao
14:35	Susa	Fang	Garg
14:55	COFFEE BREAK		
	Soft matter self-healing materials 3	Hard matter self-healing materials 2	Application of self-healing materials 3
15:30	Guan	De Belie	KEYNOTE LECTURE Montemor
15:55	Willocq	X. Wang	
16:20	Wittmer	Farnam	Uebel
16:45	Dahlke	Morozov	W. Li
17:05	Poster Session		
19:00	End of first day		

PROGRAMME AT A GLANCE

Tuesday, 27 June 2017

	Ludwig-Dürr-Saal		
8:30	PLENARY LECTURE Jonkers		
	Ludwig-Dürr-Saal	Alfred-Colsman-Saal	Theodor-Kober-Saal
	Soft matter self-healing materials 4	Characterisation and modelling 2	Application of self-healing materials 4
9:20	KEYNOTE LECTURE Otsuka	Garcia	Litina
9:45		Dietzek	Davies
10:10	Arizaga	Lauer	Yang
10:30	COFFEE BREAK		
	Soft matter self-healing materials 5	Hard matter self-healing materials 3	Application of self-healing materials 5
11:00	Song	KEYNOTE LECTURE Schlangen	Hesse
11:25	Hamilton		Kawaai
11:50	Kim	Su	White
12:10	LUNCH		
	Soft matter self-healing materials 6	Hard matter self-healing materials 4	Application of self-healing materials 6
13:20	Dean	Gruyaert	KEYNOTE LECTURE Leeuwenburgh
13:45	Schacher	Gupta	
14:10	Esser-Kahn	Antonaci	Jimenez-Pardo
14:35	Hart		Wenz
14:55	COFFEE BREAK		
	Soft matter self-healing materials 7	Hard matter self-healing materials 5	Workshop (Industry)
15:25	Thurn-Albrecht	Kayondo	
15:50	Krutyeva	Van Tittelboom	
16:15	Presselt	Roig-Flores	
16:40	Hager	Tulliani	
17:00	End of lecture programme		
18:30	Conference Dinner Boat trip		

Wednesday, 28 June 2017

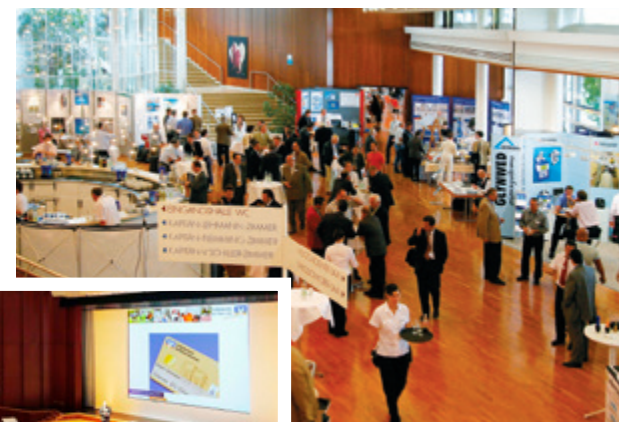
	Ludwig-Dürr-Saal		
8:30	PLENARY LECTURE Weder		
	Ludwig-Dürr-Saal	Alfred-Colsman-Saal	Theodor-Kober-Saal
	Soft matter self-healing materials 8	Characterisation and modelling 3	Application of self-healing materials 7
9:20	KEYNOTE LECTURE Craig	Jefferson	Xu
9:45		Grande	Lucas
10:10		Rong	Klein
10:30	COFFEE BREAK		
	Soft matter self-healing materials 9	Hard matter self-healing materials 6	Application of self-healing materials 8
11:00	Brubaker	Nanko	KEYNOTE LECTURE Michaud
11:25	Levy	Hayakawa	
11:50		Bei	Nakao
12:10	LUNCH		
	Ludwig-Dürr-Saal		
13:20	PLENARY LECTURE Urban		
	Ludwig-Dürr-Saal	Alfred-Colsman-Saal	Theodor-Kober-Saal
	Soft matter self-healing materials 10	Hard matter self-healing materials 7	Application of self-healing materials 9
14:10	Pyckhout-Hintzen	Zhang	Fang
14:35	Mordvinkin	Van Belleghem	Große
14:55	COFFEE BREAK		
	Soft matter self-healing materials 11	Hard matter self-healing materials 8	Application of self-healing materials 10
15:25	Zechel	Zhu	Van Mullem
15:50	Bose	Choi	Giannaros
16:15	Götz	Litina	Deng
16:40	Enke	Snoeck	
17:00	Closing remarks/Awards		
17:30	End of conference		

Sunday, 25 June 2017

Ludwig-Dürr-Saal

Chair: W. Binder¹; ¹Martin Luther University Halle-Wittenberg, Halle (Saale)/D

18:00	EVENING LECTURE Materials for Space Projects– Actual Developments and Future Needs C. Stenzel, Airbus DS, Immenstaad/D
18:45	WELCOME RECEPTION Delight in a taste of Friedrichshafen with delicious food and drink while overlooking the stunning Lake Constance (18:45 – 20:30)



Images: © GZH

Monday, 26 June 2017

8:00 Registration

Ludwig-Dürr-Saal

9:00 CONFERENCE OPENING

W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D
 U. Schubert, Friedrich-Schiller-University Jena/D

Chair: U. Schubert, Friedrich-Schiller-University Jena/D

9:15 PLENARY LECTURE

The Long and Treacherous Road to Commercialisation: Self-Healing Comes of Age
 S. White¹; ¹University of Illinois at Urbana-Champaign, Urbana/USA

10:00 Coffee break

Ludwig-Dürr-Saal

SOFT MATTER SELF-HEALING MATERIALS 1

Chair: N. Sottos¹; ¹University of Illinois at Urbana-Champaign, Urbana/USA

10:30 KEYNOTE LECTURE

Faster, Higher, Stronger: Development of Self-Healing Polymeric Materials towards a Sustainable World

M. Zhang¹; M. Rong¹; H. Xiang¹; W. Xu¹; ¹Zhongshan University, Guangzhou/CN

11:20 **Synthetic remodeling via depolymerization and repolymerization cycles in low ceiling temperature polymers**

E. Lloyd¹; H. Lopez Hernandez¹; N. Sottos¹; J. Moore¹; S. White¹; ¹University of Illinois at Urbana-Champaign, Urbana/USA

11:45 **Latent polymeric mechanocatalysts for CuAAC based self-healing and stress-sensing approaches**

P. Michael¹; M. Biewend¹; S. Funtan¹; W. Binder¹; ¹Martin Luther University Halle-Wittenberg, Halle/D

12:05 Lunch

Monday, 26 June 2017

8:00 Registration

Ludwig-Dürr-Saal

9:00 CONFERENCE OPENING

W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D
 U. Schubert, Friedrich-Schiller-University Jena/D

Chair: U. Schubert, Friedrich-Schiller-University Jena/D

9:15 PLENARY LECTURE

The Long and Treacherous Road to Commercialisation: Self-Healing Comes of Age
 S. White¹; ¹University of Illinois at Urbana-Champaign, Urbana/USA

10:00 Coffee break

Alfred-Colsman-Saal

CHARACTERISATION AND MODELLING 1

Chair: B. Dietzek¹; ¹Friedrich Schiller University Jena, Jena/D

10:30 Modelling of self-healing creep steels

C. Versteyle¹; M. Sluiter¹; N. van Dijk¹; ¹TU Delft, Delft/NL

10:55 **Application of Kinetics-based Damage-Healing Constitutive Model to FE Analysis of Self-Healing Ceramic Materials**

J. Yamamoto¹; T. Osada²; S. Ozaki¹; ¹Yokohama National University, Yokohama/J;
²National Institute of Material Science, Sengen/J

11:20 **A cohesive zone fracture mechanics-based crack healing model and its application to self-healing MAX-phase ceramics**

S. Ponnusami¹; S. Turteltaub¹; A. Farle¹; W. Sloof¹; S. van der Zwaag¹; J. Krishnasamy¹;
¹Delft University of Technology, Delft/NL

12:05 Lunch

Monday, 26 June 2017

8:00 Registration

Ludwig-Dürr-Saal

9:00 CONFERENCE OPENING

W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D
U. Schubert, Friedrich-Schiller-University Jena/D

Ludwig-Dürr-Saal

Chair: U. Schubert, Friedrich-Schiller-University Jena/D

9:15 PLENARY LECTURE

The Long and Treacherous Road to Commercialisation: Self-Healing Comes of Age
S. White¹; ¹University of Illinois at Urbana-Champaign, Urbana/USA

10:00 Coffee break

Theodor-Kober-Saal

APPLICATION OF SELF-HEALING MATERIALS 1

Chair: V. Michaud¹; ¹EPFL, Lausanne/CH

10:30 Low temperature healing of bending, Mode I and impact-induced damage of a disulphide containing polymer - glass fibre reinforced composite

W. Post¹; A. Cohades²; S. Garcia¹; S. van der Zwaag¹; V. Michaud²; ¹Delft University of Technology, Delft/NL; ²Ecole Polytechnique Fédérale de Lausanne, Lausanne/CH

10:55 Crack closure assessment through the use of SMA wires in thermally mended E-glass reinforced Poly(ϵ -caprolactone)/epoxy blends

A. Cohades¹; N. Hostettler¹; V. Michaud¹; ¹EPFL, Lausanne/CH

11:20 Applied self-healing technologies for the smart repair of composite components

T. Coope¹; R. Luterbacher¹; I. Bond¹; D. Turkenburg²; H. Fischer²; ¹University of Bristol, Bristol/UK; ²TNO Materials, Eindhoven/NL

11:45 Cyanate Ester-Based Self-Healing of CFRP Laminates

A. Burke¹; C. Hansen¹; K. Fetfatsidis²; ¹University of Massachusetts Lowell, Lowell/USA; ²Aurora Flight Sciences, Cambridge/USA

12:05 Lunch

continued on Page 21

Monday, 26 June 2017

Ludwig-Dürr-Saal

SOFT MATTER SELF-HEALING MATERIALS 2

Chair: M. Zhang¹; ¹Zhongshan University, Guangzhou/CN

13:20 Supramolecular polymers: from phase segregation and controlled (self-)assembly processes to self-healing materials

D. Döhler¹; S. Chen¹; F. Herbst¹; Y. Tingzi¹; K. Schröter¹; T. Thurn-Albrecht¹; J. Akbarzadeh²; H. Peterlik³; W. Binder¹; ¹Martin Luther University Halle-Wittenberg, Halle (Saale)/D; ²University of Vienna, Vienna/A; ³University of Vienna, Vienna/D

13:45 Role of di and tetra-sulfide containing silane on the network formation of a healable organic-inorganic hybrid dual-network

N. Zhong¹; S. van der Zwaag¹; S. Garcia¹; ¹Delft University of Technology, Delft/NL

14:10 Healable shape-memory polyurethanes using reversible TAD chemistry

N. Van Herck¹; F. Du Prez¹; ¹Ghent University, Ghent/B

14:35 Effect of the dianhydride/branched diamine ratio on the room temperature healing behavior of polyetherimides: Presenting a new self-healing mechanism

A. Susa¹; R. Bose¹; A. Grande¹; S. van der Zwaag¹; S. Garcia¹; ¹TU Delft, Delft/NL

14:55 Coffee break

SOFT MATTER SELF-HEALING MATERIALS 3

Chair: D. Döhler¹; ¹Martin Luther University Halle-Wittenberg, Halle (Saale)/D

15:30 Recent Progress in Dynamic and Self-healing Polymer Design via Supramolecular and Dynamic Covalent Bonds

Z. Guan¹; ¹University of California, Irvine, Irvine/US

15:55 Spontaneous Moisture-Driven Healing of Urea-based Polyurethane

B. Willocq¹; F. Khelifa¹; V. Lemaury¹; P. Leclère¹; J. Cornil¹; P. Dubois¹; J. Raquez¹; ¹Université de Mons, Mons/B

16:20 Modified Polyurethane Materials with Moisture or Temperature Induced Self-Healing Properties

A. Wittmer¹; A. Brinkmann¹; C. Schreiner¹; V. Stenzel¹; A. Hartwig¹; K. Koschek¹; ¹Fraunhofer IFAM Bremen, Bremen/D

16:45 Ionomers: New approaches for self-healing materials

J. Dahlke¹; R. Bose²; S. Bode¹; S. Garcia²; S. van der Zwaag²; M. Hager¹; U. Schubert¹; ¹Friedrich-Schiller-University Jena, Jena/D; ²Delft University of Technology, Delft/NL

17:05 POSTER SESSION

19:00 End of first day

Monday, 26 June 2017

Alfred-Colsman-Saal

HARD MATTER SELF-HEALING MATERIALS 1

Chair: S. Leeuwenburgh¹; ¹ Radboud University, Nijmegen/NL

- 13:20 **KEYNOTE LECTURE**
Self-healing of ceramics for high temperature applications
W. Sloof¹; ¹ Delft University of Technology, Delft/NL
- 14:10 **Design self-healing metals with Ti-Ni shape memory nano-particles**
J. Zhang¹; S. Maisel²; B. Grabowski²; C. Tasan¹; ¹ Massachusetts Institute of Technology, Cambridge/USA; ² Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf/D
- 14:35 **Autonomous filling of creep cavities in Fe-Au and Fe-W alloys**
H. Fang¹; N. van Dijk¹; S. van der Zwaag¹; ¹ Delft University of Technology, Delft/NL
- 14:55 Coffee break

HARD MATTER SELF-HEALING MATERIALS 2

Chair: E. Schlangen¹; ¹ Delft University of Technology, Delft/NL

- 15:30 **Benefits of pH-responsive superabsorbent polymers to stimulate autogenous healing of concrete cracks**
A. Mignon¹; S. Van Vlierberghe¹; N. De Belie¹; ¹ Ghent University, Ghent/B
- 15:55 **Study on Microcapsules Based Self-Healing Concrete from Macroscopic and Microscopic Points of View**
X. Wang¹; P. Wei¹; P. Sun¹; N. Han¹; Y. Fang¹; F. Xing¹; ¹ Shenzhen University, Shenzhen/CN
- 16:20 **Evaluating the Potential Use of Alginate to Enable Microbial Self-Healing in Concrete**
M. Ksara¹; S. Kashani¹; E. Mayerberger¹; C. Sales¹; C. Schauer²; Y. Farnam¹; ¹ Drexel University, Philadelphia/USA; ² Drexel University, Department of Materials Science & Engineering, Philadelphia/USA
- 16:45 **Epoxy-based alginate shell particles as functional self-triggered additives for self-healing concrete**
Y. Morozov¹; Y. Guo²; S. Zgoulli²; M. Araújo³; K. Van Tittelboom³; N. De Belie³; E. Cailleux⁴; S. Lamaka⁵; F. Montemor¹; ¹ University of Lisbon, Lisbon/P; ² Microbelcaps S.A., Liège/B; ³ Ghent University, Ghent/B; ⁴ Belgian Building Research Institute, Brussels/B; ⁵ Helmholtz-Zentrum, Geesthacht/D
- 17:05 **POSTER SESSION**
- 19:00 End of first day

Monday, 26 June 2017

Theodor-Kober-Saal

APPLICATION OF SELF-HEALING MATERIALS 2

Chair: T. Hack¹; ¹ Airbus Group Innovations, München/D

- 13:20 **Mechanical Characterization of a Self-Healing Polymer/Glass Fiber-reinforced Composite Using Diels-Alder Reversible Bonds**
G. Palmese¹; M. Diaz Acevedo¹; ¹ Drexel University, Philadelphia/USA
- 13:45 **Self-Healing and Microstructure Optimization of Spread Carbon Fiber/Epoxy Laminates**
Y. Nassho¹; K. Sanada¹; ¹ Toyama Prefectural University, Imizu-shi/J
- 14:10 **Survivability and Self-healing Efficiency of Microencapsulated Sodium Silicate in Class G Oil Well Cement**
W. Mao¹; A. Al-Tabbaa¹; ¹ University of Cambridge, Cambridge/UK
- 14:35 **New Sacrificial Materials for Multifunctional Vascular Composites**
M. Garg¹; H. Hernandez¹; N. Sottos¹; S. White¹; ¹ University of Illinois at Urbana-Champaign, Urbana/USA
- 14:55 Coffee break

APPLICATION OF SELF-HEALING MATERIALS 3

Chair: W. Fürbeth¹; ¹ DECHEMA-Forschungsinstitut, Frankfurt/D

- 15:30 **KEYNOTE LECTURE**
Self-healing coatings for advanced corrosion protection strategies: Where are we?
M. Montemor¹; ¹ University of Lisbon/P
- 16:20 **The impact of trigger signal spreading velocity on self-healing performance in smart anti-corrosion coatings**
M. Uebel¹; M. Rohwerder¹; ¹ Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf/D
- 16:45 **Microcapsule-Based Autonomous Indication of Damage and Healing in Polymeric Coatings**
W. Li¹; M. Robb¹; C. Matthews¹; J. Moore¹; S. White¹; N. Sottos¹; ¹ University of Illinois at Urbana-Champaign, Urbana/USA
- 17:05 **POSTER SESSION**
- 19:00 End of first day

Tuesday, 27 June 2017

Ludwig-Dürr-Saal

Chair: U. Schubert, Friedrich-Schiller-University Jena/D

8:30

PLENARY LECTURE**Bacteria-based self-healing concrete – from lab table to full scale application**H. Jonkers¹; ¹Delft University of Technology, Delft/NL

Ludwig-Dürr-Saal

SOFT MATTER SELF-HEALING MATERIALS 4Chair: S. van der Zwaag¹; ¹ TU Delft/NL

9:20

KEYNOTE LECTURE**Self-healing and Mechanochromic Polymers with Dynamic Covalent Bonds**H. Otsuka¹; T. Kosuge¹; A. Takahashi¹; R. Goseki¹; ¹Tokyo Institute of Technology, Tokyo/J

10:10

Dynamics of Self-healing model Polymers: Influence of Polymer Polarity and Association StrengthM. Dorau¹; D. Sokolova¹; A. Arizaga¹; A. Schmidt¹; A. Brás¹; ¹Universität zu Köln, Cologne/D

10:30

Coffee break

SOFT MATTER SELF-HEALING MATERIALS 5Chair: A. Esser-Kahn¹; ¹ University of California, Irvine/USA

11:00

Fluorescence Detection of Microcapsule-Type Self-Healing Based on Aggregation-Induced EmissionY. Song¹; B. Kim¹; T. Lee²; J. Kim¹; J. Nam¹; S. Noh¹; Y. Park¹; ¹ Korea Research Institute of Chemical Technology, Ulsan/ROK; ² Korea Research Institute of Chemical Technology, Ulsan National Institute of Science and Technology, Ulsan/ROK

11:25

Effect of Hansen Solubility Parameters in Short Duration Healing Cycle SystemsJ. Hamilton¹; C. Hansen¹; ¹ UMass Lowell, Lowell/US

11:50

Fatigue behavior of self-healing carbon fiber/thermoplastic-toughened epoxy compositesS. Kim¹; N. Sottos¹; S. White¹; ¹ University of Illinois at Urbana-Champaign, Urbana/USA

12:10

Lunch

continued on Page 25

Tuesday, 27 June 2017

Ludwig-Dürr-Saal

Chair: U. Schubert, Friedrich-Schiller-University Jena/D

8:30

PLENARY LECTURE**Bacteria-based self-healing concrete – from lab table to full scale application**H. Jonkers¹; ¹Delft University of Technology, Delft/NL

Alfred-Colsman-Saal

CHARACTERISATION AND MODELLING 2Chair: A. Jefferson¹; ¹ Cardiff University, Cardiff/UK

9:20

Detection of delamination healing of a thermoplastic ionomer interlayer in a model CFRP composite by advanced ultrasonic techniquesW. Post¹; M. Kersemans²; I. Solodov³; K. van den Abeele⁴; S. Garcia¹; S. van der Zwaag¹; ¹ Delft University of Technology, Delft/NL; ² Ghent University (UGent), Gent/B; ³ University of Stuttgart, Stuttgart/D; ⁴ KU Leuven - University of Leuven, Kortrijk/B

9:45

Optical Response of Self-Healing PolymersB. Dietzek¹; M. Micheel²; R. Geitner³; M. Schmitt³; J. Ahner³; M. Hager³; ¹ Friedrich-Schiller-University Jena, Jena/D; ² Leibniz Institute for Photonic Technology, Jena/D; ³ Friedrich-Schiller-Universität Jena, Jena/D

10:10

Self-Healing of Complex Damage Modes in Model CompositesA. Lauer¹; N. Sottos¹; ¹ University of Illinois at Urbana-Champaign, Urbana/USA

10:30

Coffee break

HARD MATTER SELF-HEALING MATERIALS 3Chair: C. Große¹; ¹ TU München/D

11:00

KEYNOTE LECTURE**Self-Healing Asphalt: From Laboratory to Field Test and back to the Lab**E. Schlangen¹; ¹ Delft University of Technology, Delft/NL

11:50

Self-Healing Asphalt Using Microcapsules Containing Rejuvenator: From Experimental Research to Real ApplicationJ. Su¹; S. Han¹; ¹ Tianjin Polytechnic University, Tianjin/CN

12:10

Lunch

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Tuesday, 27 June 2017

Ludwig-Dürr-Saal

Chair: U. Schubert, Friedrich-Schiller-University Jena/D

8:30

PLENARY LECTURE**Bacteria-based self-healing concrete – from lab table to full scale application**H. Jonkers¹; ¹Delft University of Technology, Delft/NL

Theodor-Kober-Saal

APPLICATION OF SELF-HEALING MATERIALS 4Chair: S. Choi¹; ¹Chung-Ang University, Seoul/ROK

9:20

Self-healing of cracks in concrete using impregnated lightweight aggregates with different silica based precursorsR. Alghamri¹; C. Litina¹; A. Al-Tabbaa¹; ¹ University of Cambridge, Cambridge/UK

9:45

Full-scale field trials of shape memory polymer and vascular network self-healing systems in concrete structuresR. Davies¹; M. Pilegis¹; O. Teall²; D. Gardner¹; A. Jefferson¹; R. Lark¹; ¹ Cardiff University, Cardiff/UK; ² Costain, Cardiff/UK

10:10

Tackling shell tightness of reactive microcapsules for practical application of self-healing materialsD. Sun¹; J. Yang¹; ¹ Hong Kong University of Science and Technology, Kowloon/HK

10:30

Coffee break

APPLICATION OF SELF-HEALING MATERIALS 5Chair: M. Diaz Acevedo¹; ¹ Drexel University, Philadelphia/USA

11:00

Self-sealing mechanisms in leaves of *Delosperma* species: the biological role modelL. Hesse¹; H. Klein²; T. Speck¹; O. Speck¹; ¹ University of Freiburg, Freiburg/D; ² Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI, Freiburg/D

11:25

Alginate Capsules Encapsulating Aerobic and Anaerobic Microorganism for Repairing Cracks in ConcreteK. Kawaai¹; H. Okuno¹; I. Ujike¹; ¹ Ehime University, Matsuyama/J

11:50

Capsule-filled dental composite resin for sustained biomodification of dentin matrixM. Yourdkhani¹; H. Majithia¹; L. Farsi¹; N. Sottos¹; S. White¹; ¹ University of Illinois at Urbana-Champaign, Urbana/USA

12:10

Lunch

continued on Page 27

Tuesday, 27 June 2017

Ludwig-Dürr-Saal

SOFT MATTER SELF-HEALING MATERIALS 6Chair: M. Hager¹; ¹ FSU Jena/D

13:20

Autonomous self-healing of large damage volumes by means of multiphase microvascular flowL. Dean¹; S. White¹; N. Sottos¹; ¹ University of Illinois at Urbana-Champaign, Urbana, IL/USA

13:45

Reversible and Irreversible Crosslinking in Block Copolymer-Based Nanostructured MaterialsF. Schacher¹; ¹ Friedrich-Schiller-Universität Jena, Jena/D

14:10

Adaptable Micro-vascular Materials Via Reaction-DiffusionM. Kleiman¹; K. Brubaker¹; A. Esser-Kahn¹; ¹ University of California, Irvine/USA

14:35

Healable Supramolecular Polyurethanes: Towards a Synthetic Human SkinA. Feula¹; X. Tang²; L. Hart¹; P. Buckley²; C. Siviour²; W. Hayes¹; ¹ University of Reading, Reading/UK; ² University of Oxford, Oxford/UK

14:55

Coffee break

SOFT MATTER SELF-HEALING MATERIALS 7Chair: A. Schmidt¹; ¹ Universität zu Köln, Cologne/D

15:25

Unveiling the molecular mechanism of self-healing in a telechelic, supramolecular polymer networkT. Yan¹; K. Schröter¹; F. Herbst¹; W. Binder¹; T. Thurn-Albrecht¹; ¹ Martin-Luther-Universität Halle-Wittenberg, Halle/D

15:50

Association Dynamics of A Supramolecular Linear Polymer MeltM. Krutyeva¹; W. Pyckhout-Hintzen¹; M. Monkenbusch¹; A. Bras¹; J. Allgaier¹; A. Wischnewski¹; D. Richter¹; ¹ Forschungszentrum Jülich GmbH, Jülich/D

16:15

Supra-Molecular Structure, Thermodynamic Properties and Response to Perturbations of Amphiphilic Thiazol Langmuir-Blodgett FilmsM. Hupfer¹; M. Kaufmann¹; F. Herrmann-Westendorf¹; R. Beckett¹; B. Dietzek¹; M. Presselt²; ¹ Friedrich Schiller University Jena, Jena/D; ² Leibniz-Institut für Photonische Technologien, Jena/D

16:40

Self-healing polymers based on reversible covalent bonds: From condensation reactions over exchange reactions to addition reactionsM. Hager¹; N. Kuhl¹; J. Kötteritzsch¹; S. Zechel¹; M. Abend¹; U. Schubert¹; ¹ Friedrich Schiller University Jena, Jena/D

17:00

End of lecture programme

18:30

CONFERENCE DINNER / BOAT TRIP

Tuesday, 27 June 2017

Alfred-Colsman-Saal

HARD MATTER SELF-HEALING MATERIALS 4

Chair: N. De Belie¹; ¹Ghent University, Ghent/B

- 13:20 **Test method to assess the survival probability of capsules in self-healing concrete**
E. Gruyaert¹; M. Araujo¹; N. Alderete¹; K. Van Tittelboom¹; S. Chatrabhuti²; J. Raquez²; N. De Belie¹; ¹ Ghent University, Ghent/B; ² University of Mons, Mons/B
- 13:45 **Cementitious composites capable of carbon sequestration and self-healing**
S. Gupta¹; H. Kua¹; S. Pang¹; ¹ National University of Singapore, Singapore/SGP
- 14:10 **Autogenous self-healing in cementitious materials promoted by sulfate attack**
P. Antonaci¹; J. Tulliani¹; S. Irico²; S. Mutke²; D. Gastaldi³; F. Canonico³; ¹ Politecnico di Torino, Torino/I; ² Dyckerhoff GmbH, Wiesbaden/D; ³ Buzzi Unicem, Casale Monferrato/I
- 14:55 Coffee break

HARD MATTER SELF-HEALING MATERIALS 5

Chair: S. Craig¹; ¹Duke University, Durham/USA

- 15:25 **Experimental study on the effect of wall-fixed air – water interface on water flow in narrow gaps**
M. Kayondo¹; T. Kishi¹; ¹ The University of Tokyo, Tokyo/J
- 15:50 **Application of polymeric capsules in concrete beams: survival during mixing and sealing ability of cracks**
M. Araujo¹; E. Gruyaert¹; N. Alderete¹; K. Van Tittelboom¹; S. Chatrabhuti²; J. Raquez²; N. De Belie¹; ¹ Ghent University, Ghent/B; ² University of Mons, Mons/B
- 16:15 **Self-healing evaluation of mortar with crystalline admixtures by sorptivity analysis**
M. Roig-Flores¹; C. Litina²; A. Al-Tabbaa²; P. Serna¹; ¹ Universidad Politecnica de Valencia, Valencia/E; ² University of Cambridge, Cambridge/UK
- 16:40 **Development of tubular capsules for self-healing concrete applications by cement paste extrusion and successive coatings**
G. Anglani¹; P. Antonaci¹; A. Carrillo Gonzales¹; A. Formia¹; M. Genovese¹; G. Idone¹; R. Robella¹; D. Taeb¹; J. Tulliani¹; ¹ Politecnico di Torino, Torino/I

17:00 End of lecture programme

18:30 CONFERENCE DINNER / BOAT TRIP

Tuesday, 27 June 2017

Theodor-Kober-Saal

APPLICATION OF SELF-HEALING MATERIALS 6

Chair: S. Garcia¹; ¹Delft University of Technology, Delft/NL

- 13:20 **KEYNOTE LECTURE**
Self-healing composites for bone regeneration
S. Leeuwenburgh¹; ¹ Radboud University, Nijmegen/NL
- 14:10 **Hydrophilic Polycarbonate/mPEG polyurethane networks: anti-fouling and self-replenishing coatings for marine applications**
I. Jimenez-Pardo¹; L. van der Ven¹; R. van Benthem¹; A. Esteves²; G. de With¹; ¹ Eindhoven University of Technology, Eindhoven/NL; ² Eindhoven University of Technology,, Eindhoven/NL
- 14:35 **Self-healing car paints from maize**
G. Wenz¹; C. Becker-Willinger²; G. Kali¹; H. Eisenbarth¹; ¹ Universität des Saarlandes, Saarbrücken/D; ² Leibniz-Institute for New Materials, Saarbrücken/D
- 14:55 Coffee break

INDUSTRY WORKSHOP

Chairs: W. Binder¹; ¹Martin Luther University Halle-Wittenberg, Halle (Saale)/D;
U. Schubert¹; ¹Friedrich-Schiller-University Jena, Jena/D

- 15:25 Research and development of self-healing materials have suffered several hurdles in the last years towards further commercialization. Often industry is explaining their academic partners that the process conditions in their production plants are too harsh for some of the developed materials. To close this industry-academia gap and bring these two players closer together, ICSHM 217 is offering a discussion forum with industry experts. These experts will briefly explain their needs in the field of self-healing materials and where most innovations in this field break up. Come and join this session and discuss with leading industry companies how to overcome these barriers.
- 17:00 End of lecture programme
- 18:30 CONFERENCE DINNER / BOAT TRIP

Wednesday, 28 June 2017

Ludwig-Dürr-Saal

Chair: W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D

8:30 **PLENARY LECTURE**
Healable Supramolecular Polymers
 C. Weder¹; ¹University of Fribourg, Fribourg/CH

Ludwig-Dürr-Saal

SOFT MATTER SELF-HEALING MATERIALS 8Chair: I. Bond¹; ¹ University of Bristol/UK

9:20 **KEYNOTE LECTURE**
Mechanochemical routes to self-healing polymers
 S. Craig¹; ¹ Duke University, Durham/USA

10:10 **Application of dynamic coordinate bonds for underwater self-healing of polymer**
 M. Rong¹; M. Zhang¹; N. Xia¹; ¹ Sun Yat-sen University, Guangzhou/CN

10:30 Coffee break

SOFT MATTER SELF-HEALING MATERIALS 9Chair: F. Schacher¹; ¹ Friedrich-Schiller-Universität Jena/D

11:00 **Diffusion controlled surface remodeling enables dynamic structural changes via chemical non-equilibrium**
 K. Brubaker¹; A. Esser-Kahn¹; M. Kleiman²; ¹ University of California, Irvine/USA;
² State of Israel - Ministry of agriculture and rural development, Rishon LeZion/IL

11:25 **A Biomimetic Approach to Enhance Mechanochemical Stability of Polymer Solutions**
 A. Levy¹; F. Wang¹; C. Diesendruck¹; ¹ Technion - Israel Institute, Haifa/IL

12:10 Lunch

Wednesday, 28 June 2017

Ludwig-Dürr-Saal

Chair: W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D

8:30 **PLENARY LECTURE**
Healable Supramolecular Polymers
 C. Weder¹; ¹University of Fribourg, Fribourg/CH

Alfred-Colsman-Saal

CHARACTERISATION AND MODELLING 3Chair: K. Van Tittelboom¹; ¹ Ghent University, Ghent/B

9:20 **A model for simultaneous damage, healing and capillary flow**
 A. Jefferson¹; R. Davies¹; ¹ Cardiff University, Cardiff/UK

9:45 **Finite element model of ballistic impacts on self-healing ionomers**
 L. Di Landro¹; G. Janszen¹; G. Sala¹; A. Grande¹; ¹ Politecnico di Milano, Milano/I

10:10 **Self-sealing mechanisms in leaves of Delosperma species: Numerical studies on Delosperma cooperi**
 H. Klein¹; L. Hesse²; T. Speck²; O. Speck²; ¹ Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI, Freiburg/D; ² University of Freiburg, Freiburg/D

10:30 Coffee break

HARD MATTER SELF-HEALING MATERIALS 6Chair: T. Thurn-Albrecht¹; ¹ Martin-Luther-Universität Halle-Wittenberg, Halle/D

11:00 **Self-healing via Thermal Oxidation of Mullite-based Composites with Dispersion of Nickel Particles**
 M. Nanko¹; ¹ Nagaoka University of Technology, Nagaoka, Nagaoka/J

11:25 **Self-healing behavior of Fiber Reinforced Self-healing Ceramics using TiC healing agent layer**
 T. Hayakawa¹; W. Nakao¹; ¹ Yokohama National University, Tokiwadai, Hodogaya-ku, Yokohama/J

11:50 **Autonomous high temperature self-healing capacity of spark plasma sintered Ti₃SiC₂**
 G. Bei¹; A. Farle¹; T. Osada²; S. van der Zwaag¹; W. Sloof¹; ¹ Delft University of Technology, Delft/NL; ² National Institute for Materials Science, Ibaraki/J

12:10 Lunch

Wednesday, 28 June 2017

Ludwig-Dürr-Saal

Chair: W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D

8:30

PLENARY LECTURE**Healable Supramolecular Polymers**C. Weder¹; ¹University of Fribourg, Fribourg/CH

Theodor-Kober-Saal

APPLICATION OF SELF-HEALING MATERIALS 7Chair: A. Al-Tabbaa¹; ¹University of Cambridge, Cambridge/UK

9:20

Preparation of Calcium Alginate Capsules and the Application in Asphalt MasticS. Xu¹; A. Tabakovic¹; E. Schlangen¹; X. Liu¹; ¹Delft University of Technology, Delft/NL

9:45

Development of self-healing cement pastes by long-term hydrationS. Lucas¹; ¹University of Greenwich, Chatham/UK

10:10

Self-healing Geotechnical Structures via Microbial ActionS. Botusharova¹; M. Harbottle¹; D. Gardner¹; ¹Cardiff University, Cardiff/UK

10:30

Coffee break

APPLICATION OF SELF-HEALING MATERIALS 8Chair: W. Sloof¹; ¹Delft University of Technology, Delft/NL

11:00

KEYNOTE LECTURE**Healing impact damage in fiber reinforced composite structures**V. Michaud¹; ¹EPFL, Lausanne/CH

11:50

Social impact analysis on self-healing ceramics innovationW. Nakao¹; S. Manabe¹; K. Saito¹; ¹Yokohama National University, Yokohama/J

12:10

Lunch

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Wednesday, 28 June 2017

Ludwig-Dürr-Saal

Chair: W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D

13:20

PLENARY LECTURE**Self-Healing of Polymers and Beyond**M. Urban¹; ¹Clemson University, Clemson/USA

Ludwig-Dürr-Saal

SOFT MATTER SELF-HEALING MATERIALS 10Chair: C. Diesendruck¹; ¹Technion - Israel Institute of Technology/IL

14:10

Supramolecular Association in Transiently Branched PolymersM. Staropoli¹; W. Pyckhout-Hintzen¹; C. Hövelmann¹; A. Raba¹; J. Allgaier¹; M. Krutyeva¹; A. Wischniewski¹; D. Richter¹; ¹Forschungszentrum Jülich GmbH, Jülich/D

14:35

Revealing "sticky" dynamics by solid-state NMR spectroscopyA. Mordvinkin¹; K. Saalwächter¹; ¹Martin-Luther-Universität Halle-Wittenberg, Halle/D

14:55

Coffee break

SOFT MATTER SELF-HEALING MATERIALS 11Chair: C. Weder¹; ¹University of Fribourg/CH

15:25

Functional metallopolymers: From supramolecular interactions to self-healing materialsS. Zechel¹; R. Bose²; M. Enke¹; S. Garcia²; S. van der Zwaag²; M. Hager¹; U. Schubert¹; ¹FSU Jena, Jena/D; ²TU Delft, Delft/NL

15:50

Contributions of Polymer Architecture and Hard vs. Soft Blocks to Self-healing in Supramolecular Block CopolymersR. Bose¹; M. Enke²; A. Grande¹; S. Zechel²; F. Schacher²; M. Hager²; S. Garcia¹; U. Schubert²; S. van der Zwaag¹; ¹Delft University of Technology, Delft/NL; ²Friedrich Schiller University Jena, Jena/D

16:15

Self-healing metallopolymers: Influence of the binding strength on the healing behaviorS. Götz¹; S. Zechel¹; M. Hager¹; U. Schubert¹; ¹FSU Jena, Jena/D

16:40

Self-healing metallopolymers based on reversible histidine-zinc interactionsM. Enke¹; S. Zechel¹; M. Hager¹; U. Schubert¹; ¹FSU Jena, Jena/D

17:00

CLOSING REMARKS / POSTER AWARDS

17:30

End of conference

Wednesday, 28 June 2017

Ludwig-Dürr-Saal

Chair: W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D

13:20 **PLENARY LECTURE**
Self-Healing of Polymers and Beyond
 M. Urban¹; ¹Clemson University, Clemson/USA

Alfred-Colsman-Saal

HARD MATTER SELF-HEALING MATERIALS 7Chair: J. Tulliani¹; ¹ Politecnico di Torino/I

14:10 **Self healing metals or healable metals: Design strategies for damage-resistant alloys with excellent reusability**
 C. Tasan¹; M. Wang¹; J. Zhang¹; ¹ MIT, Cambridge/USA

14:35 **Use of encapsulated polyurethane in concrete to limit chloride penetration through cracks**
 B. Van Belleghem¹; P. Van den Heede¹; K. Van Tittelboom¹; N. De Belie¹; ¹ Ghent University, Ghent/B

14:55 Coffee break

HARD MATTER SELF-HEALING MATERIALS 8

Chair: N.N.

15:25 **Build a Immune System for Concrete by Introducing Chemical Triggered Microcapsule**
 G. Zhu¹; J. Tang¹; N. Han¹; F. Xing¹; ¹ Shenzhen University, Shenzhen/CN

15:50 **Self-healing of Cracks in Cementitious Materials Incorporating Superabsorbent Polymers under Wet/dry Cyclic Condition**
 S. Choi¹; G. Hong¹; Y. Shim¹; Y. Choi²; B. Park³; ¹ Chung-Ang University, Seoul/ROK;
² Gachon University, Seongnam/ROK; ³ Korea Conformity Laboratories, Seoul/ROK

16:15 **Self-healing cementitious construction repair materials with microencapsulated mineral agents**
 C. Litina¹; A. Al-Tabbaa¹; ¹ University of Cambridge, Cambridge/UK

16:40 **Effect of the shape of superabsorbent polymers on the self-healing aspects in cementitious materials**
 D. Snoeck¹; N. De Belie¹; ¹ Ghent University, Ghent/B

17:00 **CLOSING REMARKS / POSTER AWARDS**

17:30 End of conference

Wednesday, 28 June 2017

Ludwig-Dürr-Saal

Chair: W. Binder, Martin Luther University Halle-Wittenberg, Halle (Saale)/D

13:20 **PLENARY LECTURE**
Self-Healing of Polymers and Beyond
 M. Urban¹; ¹Clemson University, Clemson/USA

Theodor-Kober-Saal

APPLICATION OF SELF-HEALING MATERIALS 9Chair: O. Speck¹; ¹ Albert Ludwigs University of Freiburg/D

14:10 **Interface characterization of Water/Self-healing Geopolymer coating with Surface modifications**
 Y. Fang¹; W. Guodong¹; G. Yin¹; B. Dong¹; N. Han¹; ¹ Shenzhen University, Shenzhen/CN

14:35 **Self-healing vs. hydrophobic bio-modified mortar – pros and cons of both materials concerning mechanical properties**
 C. Große¹; O. Lieleg¹; F. Malm¹; A. Wenzler¹; ¹ TU München, München/D

14:55 Coffee break

APPLICATION OF SELF-HEALING MATERIALS 10Chair: B. Mathes¹; ¹ DECHEMA e.V., Frankfurt am Main/D

15:25 **New cracking method to improve the evaluation of the sealing capacity of self-healing mortar via water flow tests**
 T. Van Mullem¹; J. Wang¹; B. Debbaut¹; E. Gruyaert¹; A. Beirão²; N. De Belie¹; ¹ Ghent University, Ghent/B; ² Devan Chemicals NV Portugal, Moreira Da Maia/P

15:50 **Early-age self-healing of reinforced concrete wall containing microencapsulated healing agent**
 P. Giannaros¹; A. Kanellopoulos¹; A. Al-Tabbaa¹; ¹ University of Cambridge, Cambridge/UK

16:15 **Investigation of ion diffusion in the bacterial self-healing cementitious materials using X-ray computed tomography**
 B. Liu¹; Y. Li¹; J. Zhang¹; N. Han¹; X. Deng¹; F. Xing¹; ¹ Shenzhen University, Shenzhen/CN

17:00 **CLOSING REMARKS / POSTER AWARDS**

17:30 End of conference

APPLICATION OF SELF-HEALING MATERIALS

- P 1.01 **Influence of nano-CaO in self-healing properties of cement-based mortars**
M. Stefanidou¹; E. Tsardaka¹; ¹ Aristotle University of Thessaloniki, Thessaloniki/GR
- P 1.02 **Screening of bacteria for a binary concrete crack self-healing system and optimization of spore production and calcium precipitation**
J. Zhang¹; B. Mai¹; Y. Song¹; T. Cai¹; J. Luo¹; B. Liu¹; N. Han¹; X. Deng¹; F. Xing¹; ¹ Shenzhen University, Shenzhen/CN
- P 1.03 **Screening of N₂-fixing bacteria for self-healing concrete**
J. Zhang¹; Y. Feng¹; C. Dong¹; W. Wu¹; W. Zhang¹; B. Liu¹; N. Han¹; X. Deng¹; F. Xing¹; ¹ Shenzhen University, Shenzhen/CN
- P 1.04 **Application of bacterial calcium carbonate precipitation in self-healing concrete**
Y. Lee¹; H. Kim¹; W. Park¹; ¹ Korea University, Seoul/ROK
- P 1.05 **Self-healing Random Copolymers Having Dynamic Urea Bond for Artificial Blood Vessels**
J. Park¹; I. Cheong¹; ¹ Kyungpook National University, Daegu/ROK
- P 1.06 **Fabrication of Self-Cleaning Microcapsule Encapsulating Oil using Microfluidics**
H. Jeon¹; M. Kim¹; X. Nguyen¹; D. Park¹; J. Go¹; ¹ Pusan National University, Busan/ROK
- P 1.08 **Size impact of microcapsules in room temperature, self-healing thermosets**
S. Santos¹; G. Palmese¹; ¹ Drexel University, Philadelphia/USA
- P 1.09 **Interlaminar Shear Strength and Self-Healing of Spread Carbon Fiber/Epoxy Laminates Containing Ultrasonicated Graphenes**
K. Sanada¹; R. Fujisaki¹; Y. Nassho¹; ¹ Toyama Prefectural University, Imizu-shi/J
- P 1.10 **Delamination healing in GFRP interlayers by localized induction heating**
S. Jang¹; W. Post¹; S. Zwaag¹; S. Garcia¹; ¹ Novel Aerospace Materials Group, Faculty of Aerospace Engineering, Technical University of Delft, Delft/NL
- P 1.11 **Self-healing of melamine-based surfaces?**
K. Urdl¹; U. Müller²; M. Thébault²; E. Zikulnig-Rusch¹; ¹ Kompetenzzentrum Holz GmbH, St. Veit an der Glan/A; ² Kompetenzzentrum Holz GmbH, St. Veit an der Glan/A
- P 1.12 **Development of a self-healing powder material as anti-corrosion coating for steel surfaces**
K. Braesch¹; C. Eloo¹; ¹ Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT, Oberhausen/D
- P 1.13 **Self-healing composite gels made of bisphosphonate-functionalized gelatin and bioactive glass particles for regeneration of osteoporotic bone**
M. Diba¹; W. Camargo¹; M. Brindisi²; K. Farbod¹; S. Schmidt³; M. Harrington⁴; L. Draghi²; A. Boccaccini⁵; J. Jansen¹; J. van den Beucken¹; S. Leeuwenburgh¹; ¹ Radboud University Medical Center, Nijmegen/NL; ² Politecnico di Milano, Milan/I; ³ Heinrich-Heine-University Düsseldorf, Düsseldorf/D; ⁴ Max Planck Institute for Colloids and Interfaces, Potsdam/D; ⁵ University of Erlangen-Nuremberg, Erlangen/D
- P 1.14 **Microcapsule-type protective coating having low-temperature self-healing capability**
D. Kim¹; Y. Cho¹; C. Chung¹; ¹ Yonsei University, Wonju/ROK

- P 1.15 **Application of Shrinkage-Reducing Admixtures (SRA) for Cracking Control of Box Culvert**
S. Woo¹; I. Chu¹; ¹ Korea Electric Power Research Institute, Daejeon/ROK

HARD MATTER SELF-HEALING MATERIALS

- P 2.01 **Self-healing behavior of yttrium silicates-based composites with SiC dispersion via high-temperature oxidation**
H. Vu¹; M. Nanko¹; ¹ Nagaoka University of Technology, Niigata/J
- P 2.02 **Self-Healing Bitumen Using Biomimetic Capillaries of Hollow Fibers: Fabrication, Microstructure and Properties**
J. Su¹; S. Han¹; X. Zhang¹; Y. Wang¹; ¹ Tianjin Polytechnic University, Tianjin/CN
- P 2.03 **Chloride penetration and carbonation of concrete with superabsorbent polymers**
L. De Meyst¹; B. Van Belleghem¹; D. Snoeck¹; N. De Belie¹; ¹ Ghent University, Zwijnaarde/B
- P 2.04 **The Self Healing Process of Mechanical-triggered E-51/PF Microcapsule in Cement Mortar**
G. Zhu¹; F. Xiao¹; J. Tang¹; N. Han¹; F. Xing¹; ¹ Shenzhen University, Shenzhen/CN
- P 2.05 **Assessing the self-healing capacity of UHPC mixtures through the mechanical tests and a novel self-bonding method**
A. Beglarigale¹; H. Vahedi¹; H. Yazıcı¹; ¹ Dokuz Eylül University, Izmir/TR
- P 2.07 **High-pressure water permeability method to evaluate self-healing**
M. Roig-Flores¹; P. Serna¹; ¹ Universidad Politecnica de Valencia, Valencia/E
- P 2.09 **Self-sealing concrete by using water-swelling rubber particles**
L. Lu¹; E. Schlangen¹; ¹ Delft University of Technology, Delft/NL
- P 2.10 **Investigation of microcapsules containing aqueous core embedded in the cementitious matrix**
L. Souza¹; A. Al-Tabbaa¹; ¹ University of Cambridge, Cambridge/UK
- P 2.11 **Performance of crack self healing cement mortar using modified CaO based expansive admixture with bentonite**
J. Park¹; ¹ Korea Institute of Construction Technology, Goyang/ROK
- P 2.12 **Self-healing capability of UHP-FRCC under freeze/thaw cycles**
T. Nishiwaki¹; S. Osaka²; Y. Gondai²; ¹ Tohoku University, Sendai/J; ² National College of Sendai, Natori/J

SOFT MATTER SELF-HEALING MATERIALS

- P 3.01 **Novel Methods and Polymers to Fabricate Extrinsic Self-Healing Polymer Composites**
I. Hia¹; N. Sharani¹; E. Chan¹; P. Pasbakhsh¹; ¹ Monash University Malaysia, Bandar Sunway/MAL
- P 3.02 **Mechanical and Thermomechanical Investigation of Intramolecular Cross-linked Thermoplastics**
O. Galant¹; F. Wang¹; C. Diesendruck¹; ¹ Technion - Israel Institute, Haifa/IL

POSTER PROGRAMME

- P 3.03 **Mechanochemical Activation of Small Molecules**
I. Melnik¹; C. Diesendruck¹; ¹ Technion - Israel Institute, Haifa/IL
- P 3.04 **From Carbon-Supported Copper Nanomaterials to Self-Healing Nanocomposites**
D. Döhler¹; S. Rana²; A. Shaygan Nia³; W. Binder¹; ¹ Martin Luther University Halle-Wittenberg, Halle (Saale)/D; ² University of Petroleum and Energy Studies (UPES), Dehradun/IND; ³ Technical University Dresden, Dresden/D
- P 3.05 **Mechanocatalytically active polymer networks for force-induced copper(I)-catalyzed azide/alkyne “click” reactions**
S. Funtan¹; W. Binder¹; ¹ Martin Luther University Halle-Wittenberg, Halle (Saale)/D
- P 3.06 **Encapsulation of self-healing agents via emulsion / solvent evaporation and 3D printing techniques**
H. Rupp¹; W. Binder¹; ¹ Martin Luther University Halle-Wittenberg, Halle (Saale)/D
- P 3.08 **Uncatalyzed Imine Metathesis as a new Pathway for Self-Healing Conjugated Polymers**
J. Ahner¹; M. Hager¹; B. Dietzek¹; M. Micheel¹; ¹ Friedrich Schiller University Jena, Jena/D
- P 3.09 **Poly(dimethylsiloxane)-silica-microcapsules as filler for a prospective self-healing poly(dimethylsiloxane) rubber**
L. Barnefske¹; S. Beneman¹; D. Siebler¹; H. Sturm²; ¹ Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin/D; ² Bundesanstalt für Materialforschung und -prüfung (BAM), Technische Universität Berlin, Berlin/D
- P 3.10 **Mechanochemically active networks for the copper(I)-catalyzed azide/alkyne “click” cycloaddition (CuAAC) reaction**
M. Biewend¹; P. Michael¹; W. Binder¹; ¹ Martin-Luther-Universität Halle-Wittenberg, Halle (Saale)/D
- P 3.11 **Effect of the aromatic dianhydride architecture on the healing properties of aliphatic dimer diamine based polyimides**
A. Susa¹; J. Bijleveld¹; A. Mordvinkin²; K. Saalwächter²; S. van der Zwaag¹; S. Garcia¹; ¹ TU Delft, Delft/NL; ² Martin-Luther-Universität Halle-Wittenberg, Halle/D
- P 3.12 **Thermally Adjustable Hindered Diaminodisulfides As a Dynamic Covalent Linkage toward Long-life Polymers**
A. Takahashi¹; R. Goseki¹; H. Otsuka¹; ¹ Tokyo Institute of Technology, Tokyo/J
- P 3.13 **Controlling Supra-Molecular Structures and Thermodynamic Properties of Langmuir-(Blodgett) Films of Amphiphilic Thiazole Dyes as Prerequisites for Self-Healing Photonic Membranes**
M. Hupfer¹; M. Kaufmann¹; F. Herrmann-Westendorf¹; T. Sachse¹; R. Beckert¹; B. Dietzek¹; M. Presselt¹; ¹ Universität Jena, Jena/D
- P 3.14 **Sparkling Water-assisted Self-healing of GlyMA-based Random Copolymer via New Carbonate Covalent Bonding**
S. Ju¹; I. Cheong¹; ¹ Kyungpook National University, Daegu/ROK

POSTER PROGRAMME

- P 3.16 **Innovative microorganism’s aerobic metabolism-induced self-healing polymer by connecting filamentous fungi**
A. Wada¹; M. Takeda¹; W. Nakao¹; ¹ Yokohama National University, Tokiwadai Hodogaya Yokohama/J
- P 3.17 **Intrinsic self-healing polymers with high E-modulus based on dynamic reversible urea bonds**
M. Abend¹; S. Zechel¹; R. Geitner¹; M. Siegmann¹; M. Enke¹; N. Kuhl¹; M. Klein¹; S. Gräfe¹; B. Dietzek¹; M. Schmitt¹; J. Popp¹; U. Schubert¹; M. Hager¹; ¹ FSU Jena, Jena/D
- P 3.18 **Self-healing concepts of reversible hydrogen bonds in bromobutyl rubber**
S. Stein¹; F. Böhme¹; B. Voit¹; ¹ Leibniz-Institut für Polymerforschung Dresden e. V., Dresden/D
- P 3.20 **Dual Crosslinkable Polyisoprene-block-poly(furfuryl methacrylate) (PI-b-PFMA) Block Copolymers: Irreversible vs. Reversible Crosslinking**
R. Deubler¹; F. Schacher¹; ¹ Friedrich-Schiller-Universität Jena, Jena/D
- P 3.21 **Self-recoverable Tetraarylsuccinonitrile Mechanochromophores and its Application for Mechanochromic Segmented Polyurethanes with Repeatable Activation Properties**
M. Nukui¹; T. Sumi¹; R. Goseki¹; H. Otsuka¹; ¹ Tokyo Institute of Technology, Tokyo/J
- P 3.23 **Spontaneously Restored Electrical Conductivity of Bioactive Gel Comprising Mussel Adhesive Protein-Coated Carbon Nanotubes**
Y. Jung¹; ¹ Korea Institute of Science and Technology (KIST), Jeonbuk/ROK
- P 3.24 **Regio- and stereochemical effects in force-accelerated Diels-Alder reactions**
G. De Bo¹; ¹ University of Manchester, Manchester/UK
- P 3.25 **Investigation of self-healing behaviour of epoxy matrix containing embedded DA adduct system**
Ž. Štirn¹; A. Ručigaj¹; M. Krajnc¹; ¹ University of Ljubljana, Ljubljana/SLO
- P 3.27 **Surface Modification of Silica Particles – Reinforcing of Self-Healing Elastomers**
A. Sallat¹; F. Böhme¹; A. Das¹; B. Voit¹; G. Heinrich¹; ¹ Leibniz-Institut für Polymerforschung Dresden e.V., Dresden/D
- P 3.28 **Structural Health Monitoring of Interface Self-Healing in Tri-axial Electrospun Fibers/ Glass fiber/ Epoxy composites**
J. Seyyed Monfared Zanjani¹; B. Saner Okan¹; C. Yilmaz¹; Y. Menciloglu¹; M. Yildiz¹; ¹ Sabanci University, Istanbul/TR
- P 3.29 **Evaluation of crack width and self-healing performance of a cracked concrete using a permeability test method**
D. Lee¹; K. Shin¹; S. Choi²; K. Lee²; ¹ Chungnam National University, Daejeon/ROK; ² Sungkyunkwan University, Suwon/KP
- P 3.30 **Mechanically controlled radical polymerization initiated by ultrasound**
H. Mohapatra¹; M. Kleiman¹; A. Esser-Kahn¹; ¹ University of California, Irvine/USA

POSTER PROGRAMME

CHARACTERISATION AND MODELLING

- P 4.01 **Realistic representation of the microstructure of thermal barrier coatings to enable micromechanical optimisation of their healing capacity**
S. Murali¹; ¹ Delft University of Technology, Delft/NL
- P 4.02 **Finite element analysis of self-healing process in damaged alumina/SiC nanocomposite materials**
M. Nakamura¹; T. Osada²; K. Takeo¹; S. Ozaki¹; ¹ Yokohama National University, Yokohama/J; ² National Institute of Material Science, Tsukuba/J
- P 4.03 **Numerical analysis on competitive tensile test of self-healing fiber-reinforced ceramics**
K. Takeo¹; Y. Oba¹; W. Nakao¹; S. Ozaki¹; ¹ Yokohama National University, Yokohama/J
- P 4.04 **Evaluation of the self-repair efficiency of concrete by means of Electrochemical Impedance Spectroscopy: The concept**
Y. Morozov¹; F. Montemor¹; ¹University of Lisbon, Lisbon/P
- P 4.05 **Competition between damage propagation and recovery in fiber-reinforced self-healing ceramic**
J. Lee¹; W. Nakao¹; T. Yanaseko²; ¹Yokohama National University, Yokohama/J; ² Kogakuin University, Nakano, Hachioji/J
- P 4.06 **Numerical simulation of the thermal conductivity and mechanical properties of thermal interface materials with micro or macro damages**
N. Zhong¹; S. Garcia¹; S. van der Zwaag¹; ¹ Delft University of Technology, Delft/NL
- P 4.07 **Modelling and life time prediction of self-healing thermal barrier coatings based on fatigue life methodology**
J. Krishnasamy¹; W. Sloof¹; S. van der Zwaag¹; S. Turteltaub¹; ¹ Delft University of Technology, Delft/NL
- P 4.08 **Heal-on-Command by Magnetic Heating**
A. Shaaban¹; N. Hohlbein¹; A. Schmidt¹; ¹ Universität zu Köln, Köln/D
- P 4.09 **Local stress management for fracture path deviation in metal matrix composite**
L. Zhao¹; ¹ Université Catholique de Louvain, Louvain-la-Neuve/B
- P 4.10 **Application of Shrinkage-Reducing Admixtures (SRA) for Cracking Control of Box Culvert**
P. Denissen¹; R. Bose¹; A. Susa¹; S. van der Zwaag¹; S. Garcia¹; ¹ Faculty Aerospace Engineering, Delft University of Technology, Delft/NL; ¹ TU Delft/NL

Date: 6 June 2017

Subject to alterations. Submission title and authors information as given by the submitter. No proof by DECHEMA.

SOCIAL EVENTS

Sunday, 25 June 2017

18:00 – 18:45

EVENING LECTURE

Materials for Space Projects– Actual Developments and Future Needs

Christian Stenzel, Airbus DS, Immenstaad/D

Sunday, 25 June 2017

18:45 – 20:30

WELCOME RECEPTION

Get to know a piece of Friedrichshafen with delicious food and drinks while overlooking the stunning Lake Constance.

The evening lecture and welcome reception takes place at Graf-Zeppelin-Haus.

Monday, 26 June 2017

17:05 – 19:00

Poster Party with Beer ´n` Pretzels

The poster presentations will be accompanied by cooled beer and fresh baked pretzels.

The authors are requested to be present at their poster for discussion during the poster party.

Tuesday, 27 June 2017

18:30 – 23:30

BOAT TRIP & DINNER

Enjoy a charming boat trip on the lake constance with your peers. Let yourself be pampered with tasteful dishes and cool drinks.

The band MlzzFISS will round the evening with their wide range from great current charts to unforgettable evergreens. Be prepared to shake a leg on the dancefloor!

Meeting point: 18:30 at the entrance of the Graf-Zeppelin Haus



Special tip: sunset around 21:20

VENUE

Friedrichshafen lies on the shores of Lake Constance (Bodensee) in the south of Germany. It has a population of around 60,000 and it is not only known for being a tourist resort but also as the home of the Zeppelin airships. Today, several aviation and aerospace businesses as well as businesses of the automobile industry and high tech companies who are all looking for innovative self-healing approaches are situated in Friedrichshafen.

Urbanity and nature, adventure and indulgence, technology and art, the Zeppelin town by the Lake Constance has it all. Points of interest include the baroque Schlosskirche (palace church) overlooking the lake, the architecturally remarkable Dornier Museum, and the Zeppelin Museum listed for its Bauhaus style, which is located in the harbour and houses the biggest collection on airship transportation worldwide, an art collection and temporary art exhibitions.

The **Graf-Zeppelin-Haus** is one of the most important cultural centers of the region. Here you will meet in an unforgettable ambience right on the shores of Lake Constance. The house is located directly at the marina and the waterfront promenade. Within walking distance you can reach the old town, train station, ferry port, museums and a variety of hotels.

Make the most of your stay in Friedrichshafen: Activities and sightseeing

Sightseeing

Places which are well worth visiting and investigating. Routes which pave the way for new impressions and directions. Make a journey of discovery to places like the palace, palace church, “Klangschiff” (ship of sounds), a variety of museums or some thematic trails:
<http://en.friedrichshafen.info/sightseeing>



VENUE

Zeppelin – The most beautiful way to fly

With the take-off of the first Zeppelin airship on 2 July 1900 a new era started in Friedrichshafen leaving a lasting impact on the town. About a 100 years after the first “flying giants” the Zeppelin era was continued with the Zeppelin NT cruising over the Lake Constance region since 2001. Today, 12 different routes are on offer with a flight duration between 30 minutes and 2 hours. A view from above, smoothly and gently along the Alps, over towns and cultural landscapes – a unique flight adventure from a bird’s eye view. Large panorama windows provide an impressive view from every seat. Enjoy a unique flying experience. Reservation required.

Info: Tourist-Information Friedrichshafen
Tel. +49 7541 30010 or

Deutsche Zeppelin-Reederei
Tel. +49 7541 59000
www.zeppelinflug.de

Zeppelin Museum

Situated in the historic harbour station building this museum presents the world’s largest collection on the subject of airship history, construction and travel. The main attraction is the 33 m long reconstruction of part of LZ 129 Hindenburg in its original size, which visitors can board just as the original passengers did in the 30’s. The authentically fitted passenger rooms give an impression of how people travelled during the period of the “silver giants”.

Opening hours: daily 9am – 5pm

Info: Zeppelin Museum Friedrichshafen,
Seestrasse 22, 88045 Friedrichshafen

Tel.: +49 7541 38010
www.zeppelin-museum.de





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