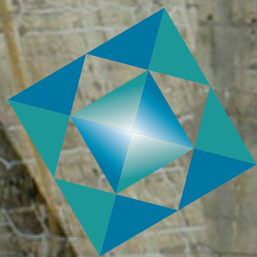


16th ICAAR

LISBOA 2020-2022



16th International Conference on
Alkali-Aggregate Reaction in Concrete
Lisboa | LNEC | Portugal | 31 May - 2 June 2022

Programme



<http://icaar2020-2022.lnec.pt>

Gold Sponsorship



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A CONSTRUIR CONFIANÇA



Technical Exhibition



Welcome message

It is with great pleasure that we welcome you to Lisboa (Lisbon) for the 16th International Conference on Alkali-Aggregate Reaction in Concrete (16th ICAAR), to take place at the National Laboratory for Civil Engineering (LNEC), between May 31 and June 2, 2022.

This International Conference, following the very successful events held in the past since 1974, claims to be a high level scientific and technical meeting related with concrete degradation due to AAR phenomena and its structural consequences. It aims at bringing together researchers, academics, and professionals in the broad field of AAR, from all over the world, to share and discuss the latest knowledge, new perspectives, experiences, and innovations on the field, as well as the present and future challenges. In this edition, the effect of coupled DEF and AAR, including the combined mechanisms and structural effects, is also addressed.

Because of the Covid-19 pandemic crisis, the Proceedings of the 16th ICAAR are composed of two volumes issued in 2021 and 2022 respectively. The first volume includes 130 papers submitted by the end of 2020, and the second volume contains 5 keynote lectures, 29 papers received in 2021 and 2022 and 21 extended abstracts of papers that have been published in special issues of scientific Journals devoted to the 16th ICAAR. All papers were peer reviewed and approved by the Scientific Committee. Among all those papers, 144 are presented in the three parallel sessions that are organized during this conference. We hope that the Proceedings and the in-person discussions that will take place at the conference will contribute to the continuous improvement of knowledge in the field of AAR.

In addition, we have arranged a 3-day post-conference technical tour to structures affected by AAR: Aguieira bridges, Alto Ceira, Santa Luzia and Pracana dams. This tour will also be the opportunity to enjoy the mountains and to visit old heritage cities and villages, such as Piodão schist village, some of them being included in the UNESCO list of World Heritage,

We would like to express our gratitude to the keynote speakers, authors, and participants for their contributions, to sponsors and partners for their support, to the members of the Scientific Committee for their efforts in handling of the papers and preparing an exciting technical program, and to the members of the Organizing Committee for the time and effort they have devoted to making possible the 16th ICAAR.

Finally, we wish all participants a fruitful work throughout this Conference and a very pleasant stay in Lisboa.

António Lopes Batista

Chair of the Organizing Committee

Bruno Godart

Chair of the Scientific Committee

Organizing Committee

António Lopes Batista (LNEC) – Chairman

António Santos Silva (LNEC)

Isabel Fernandes (ULisboa)

Luís Oliveira Santos (LNEC)

João Custódio (LNEC)

Carlos Serra (LNEC)

Scientific Committee

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Pierre Léger, Canada

Raphaël Leroy, Switzerland

Jan Lindgård, Norway

Duyon Lu, China

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Renaud-Pierre Martin, France

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Deng Min, China

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Jean-François Seignol, France

Alain Sellier, France

Katrin Seyfarth, Germany

Ahmad Shayan, Australia

Fred Shrimmer, USA

António Santos Silva, Portugal

Ian Sims, United Kingdom

Michael D. Thomas, Canada

François Toutlemonde, France

Børge Wigum, Iceland

Jonathan Wood, United Kingdom

Kazuo Yamada, Japan

Scientific Programme

The Conference topics that will be addressed under the overall ICAAR theme include:

- AAR and coupled AAR/DEF mechanisms
- Factors affecting AAR
- Preventive measures
- Testing for potential AAR
- Diagnosis, evaluation and prognosis
- Monitoring and non-destructive methods
- Structural effects of AAR and coupled AAR/DEF
- Modelling (micro, meso and macroscale)
- Repair and remedial measures
- Cases of deterioration and management

General Information

Venue

The Conference will be held at:
Laboratório Nacional de Engenharia Civil (LNEC)
Av. do Brasil 101, 1700-066 Lisboa, Portugal
Phone: (+351) 218 443 866 & (+351) 218 443 991
e-mail: icaar2020-2022@lnec.pt

www.lnec.pt

LNEC is located near the city center and close to Lisbon Airport.

Language

English is the official language of the Conference.

Internet

Free access to LNEC's wireless network in the congress center area (select: guest_lnec).

Car park

Car park is available at LNEC Campus to all participants during all Conference events.

Coffee breaks

During the session breaks, drinks are going to be served in the Congress Hall.

Lunch

Lunches will be served, near the congress auditorium

Information for authors

Authors should deliver their presentations at the Slide Desk up two hours before the start of the corresponding session.

Authors should arrive to the session room 10 minutes before the start of the session, for a meeting with the Chair.

Certificate of Attendance

Certificate of attendance will be sent to you by email after the Conference.

Mobile Phone Policy

As a courtesy to all presenters and attendees, please turn off the signal on your mobile phone while attending sessions.

Exhibitors



Social Programme

Welcome reception

Date: Monday, 30th May 2022, 18:00

Venue: LNEC Congress Centre

Conference Banquet

Date Wednesday, 1st June 2022, 20h00

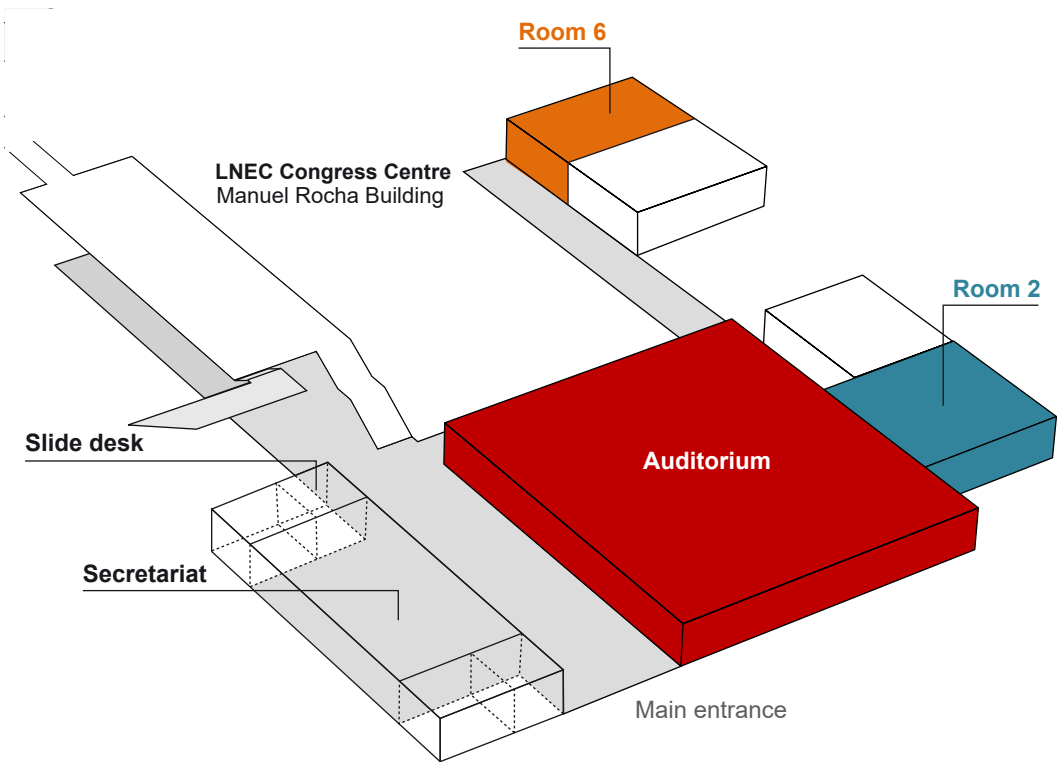
Venue Espaço Tejo – Praça das Indústrias, 1300-307 Lisboa

Departure from LNEC by bus at 19:00

Overview

	Tuesday, 31 st May 2022			Wednesday, 1 st June 2022			Thursday, 2 nd June 2022		
09:00	Opening session			Keynote 2			Keynote 4		
09:45	Keynote 1			Keynote 3			Keynote 5		
10:30	Coffee Break			Coffee Break			Coffee Break		
11:00	S1a	S1b	S1c	S4a	S4b	S4c	S7a	S7b	S7c
12:30	Lunch			Lunch			Lunch		
14:00	S2a	S2b	S2c	S5a	S5b	S5c	S8a	S8b	
15:30	Coffee Break			Coffee Break			Coffee Break		
16:00	S3a	S3b	S3c	S6a	S6b	S6c	S9a	S9b	
17:00							Closing session		

Congress Centre plan



30th MAY 2022

RILEM Meetings

09:00 - 14:30

Room 2

09:00 TC 301 ASR WP1

10:30 TC 301 ASR WP2

13:00 TC 301 ASR WP3

14:30 - 17:45

Room 6

14:30 General TC 301 ASR meeting

16:15 General TC 300 ARM meeting



REGISTRATION

The registration desk will be open from 14:30 to 17:30

18:00 Welcome reception

LNEC Congress Centre

31st MAY 2022

09:00

Auditorium

OPENING SESSION

Laura Caldeira, President of LNEC

António Batista, Chair of Organizing Committee

Bruno Godart, Chair of Scientific Committee

Isabel Fernandes, ICAAR International Committee

09:45

Auditorium

KEYNOTE LECTURE

Chairs: Bruno Godart and António Batista

Alkali-silica reaction – physical and chemical effects

Benoît Fournier

10:30

Coffee break

11:00

Room 2

Session 1a — AAR mechanisms

Chair: Jason Ideker

Questions and answers about alkali-carbonate reaction seen through the lens of osmotic mechanism

*Carlos Milanesi, Silvina Marfil and **Francisco Locati***

Investigations on alkali-silica reaction products using Raman spectroscopy

***Miriam E. Krüger**, Volker Thome, Harald Hilbig, Melanie Kaliwoda and Detlef Heinz*

Quantification of the extent of alkali-silica reaction occurring in cemented waste packages based on simplified model systems

***Nicolas Courtois**, Céline Cau Dit Coumes, Philippe Gaveau, Arnaud Poulesquen, Jérémy Haas, Seif Ben Hadj Hassine and David Bulteel*

Influence of alkali supply from outside on the dissolution behavior of aggregates

Klaus-Juergen Huenger, Mario Kositz and Matti Danneberg

Performance of Alternative Pozzolans - Alkali Silica Reactivity

Eduard Tora Bueno, Christopher Ferraro, Jerry Paris, Kyle Clavier, Kyle Riding and Timothy Townsend

Comparison of alkali-silica reaction in low molarity alkali-activated versus Portland-based binary concrete blends

Chloé Monin, Leah Kristufek, Diego Jesus de Souza, Leandro Sanchez, Nicole Hasparyk and Agnes Bezerra

11:00

Room 6

Session 1b — Factors affecting AAR

Chair: Mario de Rooij

Creep and strength of pavement concrete containing alkali sensitive aggregates after climate simulating tests

Oliver Mielich, Hans-Wolf Reinhardt and Hasan Özkan

Stress conditions in quartzite and their quantification by RAMAN spectroscopy

*Klaus-Juergen Huenger, **Matti Danneberg**, Steven Herold and Joerg Acker*

Evaluation of the presence of ettringite in concrete structures affected by alkali silica reaction

Víctor Lanza and Pilar Alaejos

Assessment of alkali-silica reaction related expansion and damage in alkali-activated slag/fly ash concretes

*Alexandre Rodrigue, **Josée Duchesne**, Benoît Fournier, Benoît Bissonnette and Mathieu Champagne*

Factors affecting the alkali release from concrete aggregates

Soley Unnur Einarsdottir and R. Doug Hooton

11:00

Auditorium

Session 1c — Preventive measures

Chair: Ingmar Borchers

Use of a zeolite-bearing pozzolan to inhibit the reactivity of a sand from Argentina

*Juan Berezosky, Francisco Locati, Darío Falcone, **Silvina Marfil** and Gabriela Coelho dos Santos*

The new version of the French recommendations to prevent disorders due to Delayed Ettringite Formation

***Bruno Godart** and Loïc Divet*

Prevention of ASR by use of low alkali OPC and silica fume. Field and lab studies from the Maridal culvert and the Storo bridge in Oslo, incl. assessment of residual expansion

***Bård Pedersen**, Eva Rodum, Marit Haugen and Jan Lindgård*

The Carbonation of Recycled Concrete Aggregate Affected by Alkali-Silica Reaction

Michael Thomas and Sean Monkman

The use of wood ash as supplementary cementitious materials to mitigate the alkali-aggregate reaction (AAR) in concrete structures

Luan Antunes, Leandro Sanchez and Diego Souza

Novel Alkali Silica Reaction Inhibitors for Concrete

Gopakumar Kaladharan, Tiffany Szeles and Farshad Rajabipour

12h30

Lunch

14:00

Room 2

Session 2a — Coupled AAR/DEF mechanisms

Chair: Benoît Fournier

Influence of Delayed Ettringite Formation (DEF) on physical and mechanical properties of concrete

Dioice Schovanz, Francieli Tiecher, Nicole Pagan Hasparyk and Selmo Kuperman

Influence of moisture on the development of Delayed Ettringite Formation

Renaud-Pierre Martin, Amandine Bonnet, Jean-Claude Renaud, Robert Chlela, François Toutlemonde and Cyrille Sauvaget

Interaction of DEF and AAR, a Review

Bruno Godart and Jonathan Wood

Influence of maximum temperature at early age of concrete and R2O and/or SO₃ content on DEF expansion of concrete

Shunsuke Hanehara and Tetsuya Oyamada

Influence of DEF expansion on mechanical behavior under uniaxial compressive stress evaluated by Digital Image Correlation

Misato Fujishima, Taito Miura, Yuichiro Kawabata and Hikaru Nakamura

Impact of Internal Sulfate Reaction (ISR) expansion on concrete transfer and containment properties: detection and modification of properties.

Arthur Pichelin, Myriam Carcassès, Georges Nahas and Franck Cassagnabère

14:00

Room 6

Session 2b — Factors affecting AAR

Chair: Ian Sims

Experimental study of the effects of mechanical restraints on ASR expansions in concrete

Joaquín Liaudat, Carlos M. López and Ignacio Carol

Chemical and petrographic characterization of aggregates used in the 1st AAR-8 Round Robin Test

*Esperanza Menendez, **Isabel Fernandes**, Josée Duchesne and António Santos Silva*

Implementation of the method RILEM AAR-8 test method of alkali release from aggregates. Assessment of results from the 1st Round Robin Test

*Esperanza Menéndez, **António Santos Silva**, Josée Duchesne, Mario Berra, Klaartje De Weerd, Isabel Fernandes, Ricardo García-Roves, Dora Soares, Benoît Fournier, Teresa Mangialardi, Jan Lindgård and Børge J. Wigum*

Microstructural study of the chemical and physical nature of Alkali Aggregate Reaction

***Per Hagelia** and Isabel Fernandes*

Physicochemical properties of synthetic alkali-silica reaction gels

***Asghar Gholizadeh-Vayghan** and Farshad Rajabipour*

A study on ASR in high strength lightweight aggregate concrete

***Tor Arne Martius-Hammer**, Jan Lindgård and Bård Pedersen*

14:00

Auditorium

Session 2c — Preventive measures

Chair: Stefan Krispel

Long-term efficiency of silica fume and fly ash to suppress ASR in field structures

***Andreas Leemann** and Christine Merz*

Dissolution behaviour of SCMs in alkaline environment and mechanisms behind ASR mitigation

*Marie Joshua Tapas, Kirk Vessalas, **Paul Thomas** and Vute Sirivivatnanon*

Mitigation of ASR using aggregate fines as alternative for SCMs

*Elsie Nsiah-Baafi, Marie Joshua Tapas, Kirk Vessalas, **Paul Thomas** and Vute Sirivivatnanon*

The use of self-healing technology combined with supplementary cementing materials to mitigate the Alkali-Silica Reaction distress.

***Diego Souza**, Leandro Sanchez, Alireza Biparva and Luan Antunes*

Prevention of internal sulphate reaction in concrete. Long-term results of the effect of mineral additions

***António Santos Silva**, António Bettencourt Ribeiro and Loic Divet*

Long-term Evaluation of Outdoor Exposure Blocks made with High-alkali Cement-SCM Combinations

***R. Doug Hooton** and Benoît Fournier*

15:30

Coffee break

16:00

Room 2

Session 3a — Testing for potential AAR

Chair: Silvina Marfil

Investigations on the influence of sand and testing conditions on the expansion behaviour of concretes in ASR tests

Wibke Hermerschmidt, Christoph Mueller and Matthias Boehm

A New Performance Test Method for Alkali-Silica Reaction

*Edward Moffatt, **Michael Thomas**, Michael Laskey and Mahipal Kasaniya*

Ways to Evaluate Alkali-Silica Reactivity of Mineral Fillers

*Noura Sinno and **Medhat Shehata***

ASR testing versus **field experience in Austria**

Helga Zeithofer, Birgit Achleitner, Gerald Maier, Clémence Bos, Martin Peyerl and Stefan Krispel

Protocols for investigating reactivity of aggregates and alkali thresholds for ASR prevention

*Elsie Nsiah-Baafi, Kirk Vessalas, **Paul Thomas** and Vute Sirivivatnanon*

Evaluation of laboratory test methods for assessing the alkali-reactivity potential of aggregates by field site tests

Ingmar Borchers, Jan Lindgård and Christoph Müller

16:00

Room 6

Session 3b — Factors affecting AAR

Chair: Stéphane Multon

Expansion Prediction for Alkali-Silica-Reaction under Real Environment and Confinement Conditions

Xi Ji and Yuya Takahashi

A study on the effect of aggregate type on pore solution composition

*Krishna Siva Teja Chopperla and **Jason Ideker***

Impact of different added alkalis on concrete expansion due to ASR

Andreas Leemann

A review on the role of moisture and temperature in alkali-silica reaction (ASR)

Olusola Olajide, Michelle Nokken and Leandro Sanchez

Analysis of two methods for determining the potential extraction of alkalis from fly ash and its contribution to the total alkalis in concrete with the time

Esperanza Menéndez, Ricardo García-Roves, Beatriz Aldea and Hairon Recino

16:00

Auditorium

Session 3c — Preventive measures

Chair: António Santos Silva

The ability of $\text{Ca}(\text{NO}_3)_2$ to suppress alkali-silica reaction

Tandre Oey, Erika La Plante, Gabriel Falzone, Yi-Hsuan Hsiao, Akira Wada, Linda Monfardini, Mathieu Bauchy, Jeffrey Bullard and Gaurav Sant

Experimental modeling of burnt oil shale impact towards ASR

Alexandra Bourdot, Vincent Thiéry, Stéphane Cuchet and David Bulteel

Internal water-repellent treatment – a novel strategy for mitigating alkali-aggregate reaction in concrete pavements

Frank Weise, Matthias Fladt and Marko Wieland

Despite Stanton: AAR from denial to remedy in the UK, Europe & the World

Ian Sims and Alan Poole

Correlating field and laboratory investigations for preventing ASR in concrete – the LNEC cube study

João Custódio, António Santos Silva, Jan Lindgård, Benoit Fournier, Michael Thomas, Thanos Drimalas, Jason Ideker, Renaud-Pierre Martin, Ingmar Borchers, Børge Wigum and Terje Rønning

Effectiveness of ground glass powder in binary and ternary cementitious systems for preventing expansion in concrete incorporating an alkali-silica reactive aggregate

Isabelle Fily-Paré, Benoît Fournier, Josée Duchesne and Arezki Tagnit-Hamou

17:45 - 19:00

Room 2

Meeting ICAAR International Committee

1st JUNE 2022

09:00

Auditorium

KEYNOTE LECTURES

Chairs: Isabel Fernandes & Ian Sims

Alkali silica reaction – sequence, products and possible mechanisms of expansion

Andreas Leemann

Importance of petrographic diagnosis and a proposal of comprehensive management flow of concrete structures for alkali-aggregate reaction

Kazuo Yamada

10:30

Coffee break

11:00

Room 2

Session 4a — Testing for potential AAR

Chair: Leandro Sanchez

Global Research and Collaboration on Alkali Aggregate Reactions in Concrete: ICAAR-Conferences and RILEM TCs Achievements

***Børge Johannes Wigum**, Özge Andiç-Çakır, Philip Nixon, Ian Sims, Alan Poole, Benoît Fournier, Jason H. Ideker and Jan Lindgård*

Testing of Icelandic aggregates and various binders – laboratory vs. field; A decade of results and experiences.

*Børge Johannes Wigum and **Guðbjartur Jón Einarsson***

RILEM Technical Committee 258-AAA. Development of a performance-based testing concept

***Børge Johannes Wigum** and Jan Lindgård*

Application of RILEM test methods for alkali-silica reactivity evaluation of Polish aggregates for concrete road structures

*Michał A. Glinicki, Daria Józwiak-Niedzwiedzka, **Aneta Antolik**, Kinga Dziedzic and Karolina Gibas*

Impact of storage conditions on expansion due to ASR

*Lionel Sofia, **Karen Scrivener** and Théodore Chappex*

Alkali boosting in ASR performance testing – Will extra addition of alkalis to the mix design candidate reflect expansion behaviour of cement clinker alkali variation?

Terje F. Rønning, Jan Lindgård and Sigrun K. Bremseth

11:00

Room 6

Session 4b — Factors affecting AAR

Chair: António Bettencourt Ribeiro

Applying the Damage Rating Index for the spatial damage assessment in concrete specimens affected by alkali-silica reaction

Mathieu Champagne, Jan Lindgård, Benoît Fournier and Josée Duchesne

Prediction of concrete expansion induced by alkali-silica reaction considering time-dependent reaction kinetics

Hyo Eun Joo and Yuya Takahashi

Investigations on the feasibility of the CWE method to verify potential alkali release from aggregates in Norwegian field concrete

Tobias Danner, Klaartje De Weerd, Bård Pedersen and Jan Lindgård

ASR in alkali-activated mortars containing reactive glass wastes

Andrea Saccani, Stefania Manzi, Alessandra Michelacci and Isabella Lancellotti

Potentially alkali-reactive recycled aggregates - Their effect on concrete's mechanical characteristics

Miguel Barreto Santos, Jorge de Brito and António Santos Silva

11:00

Auditorium

Session 4c — Preventive measures

Chair: Arlindo Gonçalves

The ability of SCMs to mitigate ASR in cements of higher alkali contents assessed by pore solution method

*Marie Joshua Tapas, Lionel Sofia, Kirk Vessalas, **Paul Thomas**, Warren South, Vute Sirivivatnanon and Karen Scrivener*

Performance of Portland-limestone cements with supplementary cementitious materials to mitigate alkali-silica reaction

*Krishna Siva Teja Chopperla and **Jason Ideker***

Alkali thresholds in concrete; the balanced alkali approach in ASR mitigation

*Brendan Boyd-Weetman, **Paul Thomas**, Vute Sirivivatnanon and Jason Nairn*

Effectiveness in ASR mitigation: incorporate SCM during the Portland cement manufacturing or in the concrete production?

Kelvya Vasconcelos Moreira, Paulo Gomes Oliveira, Ênio Pontes de Deus and Antônio Bezerra Cabral

Using the miniature concrete prism test (MCPT) to evaluate ASR preventive measures

Ardalan Ghanizadeh, Michael Thomas, Thanos Drimalas, Krishna Siva Teja Chopperla, Anuj Parashar, Jason Ideker, Racheal Lute and Kevin Folliard

Alkali-Silica Reaction Mitigation Performance of Unconventional and Marginal Source Fly Ashes

Leonhardt Thinley, Ying Wang, Lisa Burris, Douglas Hooton, Prannoy Suraneni and Christopher Shearer

12h30

Lunch

14:00

Room 2

Session 5a — Testing for potential AAR

Chair: Børge Wigum

ASR performance testing concepts – RILEM AAR-10, AAR-11 and AAR-12

Terje F. Rønning, Jan Lindgård and Ingmar Borchers

Assessing AAR Potential of processed Wadi Aggregates in Qatar, Arabian Gulf

Ian Sims, Khaled Hassan, Murray Reid, Alex Smith and Mohammed Bin Saif Al-Kuwari

Fundamental study on ASR kinetics – effect of temperature on aggregate reactivity and pore-water composition

Klaartje De Weerd, Petter Hemstad, Harald Justnes, Tone Østnor, Terje F. Rønning and Jan Lindgård

Determining the pH of concrete pore water for alkali-wrapping considering alkali dissolution from aggregate

Kazuo Yamada, Yuichiro Kawabata, Takashi Kawakami and Yasutaka Sagawa

PARTNER Project post documentation study – condition assessment of field exposure site cubes (Part I – results of physical and chemical testing)

Jan Lindgård, Ingmar Borchers, João Custódio, Esperanza Menéndez, Benoit Fournier and Børge J. Wigum

AW-CPT as an ideal laboratory potential expansion test for ASR with constant alkali content and maximized water supply and the design of an alkali solution for wrapping

Kazuo Yamada, Yuichiro Kawabata, Takashi Kawakami, Yasutaka Sagawa and Shoichi Ogawa

14:00

Room 6

Session 5b — Cases of deterioration and management

Chair: Haroldo Bernardes

Study of cracks orientation on reinforced concrete affected by Alkali-Aggregate Reaction

*Gabriella P. Andrade, Leandro Sanchez, Benoît Fournier and **Agnès Bezerra***

Reinforcement and replacement interventions in some bridges located on Aguieira Dam road system

*Tiago Rodrigues, **Ana Rita Pereira** and André Costa*

Structural behavior of Pracana dam 30 years after the large rehabilitation due to severe ISR-ASR damage

***José Piteira Gomes**, Domingos Silva Matos, António Lopes Batista and Ilídio Ferreira*

Predicting the Incidence of Alkali-Aggregate Reaction in Finnish Bridges with Machine Learning

***Tandr  Oey**, Tapio Vehmas, Miguel Ferreira and Edgar Bohner*

Monitoring and assessment of the structural effects due to ASR in Santa Luzia dam (Portugal)

***Jos  Piteira Gomes**, Jo o Gomes Cunha, Ant nio Lopes Batista and Fernando Almeida*

Measurement of the Mechanical Properties of Concrete at the Mactaquac Generating Station to Enable Modeling of Future ASR Impacts and Mitigation

***Ashlee Hossack**, Michael Thomas, Edward Moffatt, Krista MacDonald and Glendon Hanscom*

14:00

Auditorium

Session 5c — Modelling (micro, meso and macroscale)

Chair: Alain Sellier

Numerical design of experiments applied to modelling structural element affected by DEF

***Jean-Francois Seignol**, Thanh-Long L  and Pierre Argoul*

ASR expansions modelling under multi-axial stresses

***Pierre Morenon**, St phane Multon and Alain Sellier*

Modelling the behavior of ASR affected structures using homogenized reinforced concrete finite elements

***Daniela Vo**, Pierre Morenon, St phane Multon, Alain Sellier, Etienne Grimal, Beno t Masson, Anass Cherki El Idrissi and Philippe Kolmayer*

On the macro modelling of the Alkali-Aggregate Reaction in concrete: Numerical implementation in Abaqus Explicit

Ali Nour and Abdelhalim Cherfaoui

Coupled constitutive equations for assessing mechanical effects of Internal Swelling Reactions

Bruno Delano Regnicoli Benitez, Jean François Seignol and Boumediene Nedjar

Development of an Engineering-Based FE Approach to Perform the Condition Assessment of Structures Affected by Alkali-Silica Reaction

Rodrigo Gorga, Leandro Sanchez and Beatriz Martin-Perez

15:30

Coffee break

16:00

Room 2

Session 6a — Testing for potential AAR

Chair: João Custódio

Investigations of reaction kinetics in solution experiments to avoid the alkali-silica reaction

Gyde Hartmut and Frank Schmidt-Döhl

Sequel of the IMPROVE Project: petrographic analysis of the concrete from concrete prism tests

Isabel Fernandes, António Santos Silva, Violeta Ramos and Dora Soares

Detailed petrographic characterization for quantification of ASR potential of quartz-rich rocks

Aneta Kuchařová, Markéta Kuchyňová, Šárka Šachlová, Richard Přikryl and Zdeněk Pertold

Petrographic Characterization of Highly Reactive Sand from Western Texas, USA

April Snyder, Blake Restelli, Ashish Patel, Jerry Paris, Eric Giannini and Christopher Ferraro

Overview on improving the guidance of AASHTO R 80 and ASTM C1778 for ASR potential and prevention with SCMs

Anuj Parashar, Krishna Siva Teja Chopperla, Ardalan Ghanizadeh, Racheal Lute, Thanu Drimalas, Michael Thomas, Kevin Folliard and Jason H. Ideker

16:00

Room 6

Session 6b — Sinergia project

Chair: Andreas Leemann

Dissolution of concrete aggregates

***Mahsa Bagheri**, Barbara Lothenbach, Andreas Leemann and Karen Scrivener*

Characterization of synthetic ASR products by TEM and comparison with on-field early stage ASR products.

*Solène Barbotin, Zhenguo Shi, Emmanuelle Boehm-Courjault, Andreas Leemann and **Karen Scrivener***

A micro-XAS and XRD study of the crystalline alkali-silica reaction products

*Guoqing Geng, Zhenguo Shi, **Rainer Dähn**, Andreas Leemann, Erich Wieland and Barbara Lothenbach*

Synthesis of ASR products: role of calcium, potassium and sodium

*Zhenguo Shi and **Barbara Lothenbach***

Solubility data for ASR products

***Barbara Lothenbach** and Zhenguo Shi*

Evolution of alkali-silica reaction cracks and products in concrete at the meso-scale studied by X-ray micro-tomography

*Mahdieh Shakoorioskooie, Michele Griffa, **Andreas Leemann**, Robert Zboray and Pietro Lura*

16:00

Auditorium

Session 6c — Modelling (micro, meso and macroscale)

Chair: José Piteira Gomes

Assessing and forecasting ASR-induced expansion in the laboratory and in the field

***Leandro Sanchez**, Antonio Carlos dos Santos, Benoît Fournier, Mayra T. de Grazia and Diego Souza*

Prediction of the structural behaviour of Bemposta dam (Portugal), affected by concrete swelling

***Ivo Dias**, António Lopes Batista and Rodolfo Rebelo*

ASR : 3D microstructure reconstruction of reactive aggregate from 2D images

***Xiujiao Qiu**, Maxim Deprez, Guang Ye and Geert De Schutter*

Studies on flexural behavior of post-tensioned concrete beam structure deteriorated by alkali-silica reaction

Takuro Maeda, Yukio Hiroi, Takashi Yamamoto, Hideki Manabe and Toyo Miyagawa

A Probabilistic Homogenization Approach for the Computation of Stiffness Degradation in ASR-affected Concrete

Thuc Nguyen, Emre Erkmen, **Leandro Sanchez** and Jianchun Li

Influence of temperature and stress field seasonal variations in the development of concrete swelling in dams. Application to the case of Covão do Meio dam (Portugal)

Ivo Dias, António Lopes Batista and Samuel Ferra

18:00 - 19:00

Room 2

Meeting of Applied Petrography Group

20:00

Banquet

During the banquet will be presented the *Gunnar Idorn Award for Life Achievement in AAR*

2nd JUNE 2022

09:00

Auditorium

KEYNOTE LECTURES

Chairs: José Manuel Catarino & Selmo Kuperman

9:00 Modelling mechanical effects of AAR and DEF

Alain Sellier

9:45 Deterioration processes of dams affected by concrete swelling reactions. The Portuguese experience in monitoring and rehabilitation

António Batista

10:30

Coffee break

11:00

Room 2

Session 7a — Monitoring and non-destructive methods

Chair: Renaud-Pierre Martin

Monitoring of ASR/ISR structural effects in Aguieira bridges

Luis Oliveira Santos, Min Xu and António Santos Silva

Effect of confinement on Alkali-Aggregate Reaction (AAR): expansion and damage

Nusrat Zubaida, Andisheh Zahedi R. and Leandro Sanchez

Early-age detection of ASR in laboratory samples using ultrasonic coda wave monitoring

Sina Mehdinia, Krishna Siva Teja Chopperla, Ali Hafiz, Thomas Schumacher and Jason Ideker

Monitoring alkali-aggregate reaction (AAR) induced expansion through the use of fiber Bragg grating sensors

Gustavo Macioski, Leandro Sanchez, Xiaoyi Bao and Marcelo Farias de Medeiros

Proposal of management method for PC girder subjected to alkali silica reaction

Munenobu Murasaka and Motoyuki Suzuki

Study of 76 bridges potentially attacked with DEF

Renaud Leconte, Ophélie Beyrand, Guillaume Puyhaubert, Didier Vernin and Abdelkrim Ammouche

11:00

Room 6

Session 7b — Diagnosis, evaluation and prognosis

Chair: Josée Duchesne

Diagnosis and prognosis of ASR in an airfield pavement

*Eric Giannini, April Snyder and **Thano Drimalas***

Automated Assessment of Damage in Concrete

*Leandro Sanchez, Maia Fraser, **Agnes Bezerra** and Gabriella Puente*

Microscopic Assessment of Alkali-Silica Reaction (ASR) affected Recycled Concrete Aggregate (RCA) mixtures derived from Construction and Demolition Waste (CDW)

*Leandro Sanchez, **Andisheh Zahedi**, Yufeng Zhu and Benoit Fournier*

Multi-level assessment of the ASR damage including Vickers' hardness in concrete

***Diego Souza** and Leandro Sanchez*

Effect of Confinement on ASR-induced expansion and damage

Andisheh Zahedi and Leandro Sanchez

11:00

Auditorium

Session 7c — Modelling (micro, meso and macroscale)

Chair: Jean-François Seignol

Thermodynamic modeling of silica dissolution kinetics of quartzitic aggregates stored in highly alkaline solution

*Mario Kositz and **Klaus-Juergen Huenger***

Application of hybrid HSCT-FE models to identify the swelling effect on a multiple arch dam

***Sérgio Oliveira**, Miguel Rodrigues and Jorge Proença*

Heat flux and dissolution of reactive aggregate powders via isothermal nanocalorimetry

Cody Strack, Shinita Jordan, Robert Moser and Gordon Borne

Numerical simulation of concrete swelling using mesoscale particle models taking into account aging viscoelasticity and damage

***Carlos Serra**, Nuno Monteiro Azevedo and António Lopes Batista*

Influence of different expansion models on the anisotropy of ASR expansion under restraint evaluated by 3D-RBSM

***Taito Miura**, Stephane Multon and Yuichiro Kawabata*

Analysis, interpretation and prediction of the structural behavior of Cahora Bassa dam (Mozambique), affected by concrete swelling

Ivo Dias, António Lopes Batista and Ezequiel Carvalho

12h30

Lunch

14:00

Room 2

Session 8a — Structural effects of AAR and coupled AAR/DEF

Chair: Luís Oliveira Santos

Internal Swelling Reactions in massive structures: multi-scale experimental approach

Jacques Jabbour, Aveline Darquennes, Loïc Divet, Rachid Bennacer, Jean-Michel Torrenti, Georges Nahas

Development of hybrid HSCT-FE models to study the behavior of large dams due to concrete swelling

Miguel Rodrigues, Sérgio Oliveira and Jorge Proença

Effect of confinement on steel-concrete bond behavior of alkali-silica reactive (ASR) concrete

*Olesya Zhychkovska, Shamim Sheikh and **Daman Panesar***

Concrete block sites in Brazil for assessing ASR, ISA and coupled attack over time

*Nicole Hasparyk, **Selmo Kuperman**, Jeferson Bronholo, Solanda Oliveira, Mariana Bragança, Betina Medeiros and Kleber Portella*

The combined role of alkali silica reaction and delayed ettringite formation in durability loss of concrete structures

*Liam Martin, **Paul Thomas**, Vute Sirivivatnanon and Pre de Silva*

Effect of alkali-silica reaction on aggregate interlock shear transfer in reinforced concrete structures

*Francis Thériault, Martin Noel and **Leandro Sanchez***

14:00

Room 6

Session 8b — Diagnosis, evaluation and prognosis

Chair: Esperanza Menéndez

Assessment of AAR-induced expansion and damage through the direct shear test

*Rouzbeh Ziapourrazlighi, Cassandra Trottier and **Leandro Sanchez***

Evaluation of the potential of residual expansion in concrete affected by Alkali Aggregate Reaction

*Nusrat Zubaida, **Andisheh Zahedi** and Leandro Sanchez*

Alkali-silica reaction in volcanic rocks: a worldwide comparative approach

*Sara Medeiros, **Isabel Fernandes**, Benoît Fournier, João Carlos Nunes, António Santos Silva, Violeta Ramos and Dora Soares*

PARTNER Project post documentation study – condition assessment of field exposure site cubes (Part II – results of microstructural analyses)

*Isabel Fernandes, **Andreas Leemann**, Esperanza Menéndez, Benoît Fournier, Jan Lindgård, João Custódio and Børge J. Wigum*

Microstructural evaluation of the real concrete pavements with potential AAR signs

Aneta Antolik, Daria Józwiak-Niedźwiedzka and Ulrich Diederichs

Microscopic characterization of alkali-silica reaction (ASR) affected recycled concrete mixtures

***Cassandra Trottier**, Leandro Sanchez, Francisco Locati and Rouzbeh Ziapour*

15:30

Coffee break

16:00

Room 2

Session 9a — Repair and remedial measures

Chair: Carlos Serra

Effect of different field exposure conditions and surface treatments on internal relative humidity (RH) and expansion

***Eva Rodum**, Bard Pedersen, Ola Skjølsvold, Mathieu Champagne and Jan Lindgård*

The rehabilitation of a dual carriage concrete roadway damaged by alkali silica reaction

***Janina Prakash Kanjee**, Mark Alexander and Yunus Ballim*

Diagnosis and structural recovery of foundation blocks under AAR attack in a building in Brazil

***Cláudia Nathália T. Costa**, Cláudia Nathércia T. Costa and Angelo Costa e Silva*

Cases of alkali-aggregate reactions in radioactive waste management in Belgium

Seif Ben Hadj Hassine

16:00

Room 6

Session 9b — Diagnosis, evaluation and prognosis

Chair: Terje F. Rønning

Predicting the effect of SCMs on ASR in the accelerated mortar bar test with artificial neural networks

***Maxime Ranger**, Marianne Tange Hasholt, Ricardo Antonio Barbosa and Lene Højris Jensen*

Profiling the internal damage within an ASR-affected dam with the Damage Rating Index (DRI)

Mathieu Champagne, Jan Lindgård, Benoît Fournier, Benoit Bissonnette and Duchesne Carl

Stiffness damage testing of laboratory cast alkali-silica reactive concrete and cores drilled from a real concrete structure

Kathrine Mürer Stemland, Eva Rodum, Terje Kanstad

Alkali-Carbonate Reaction Concrete Prism Test Samples – Macroscopic Petrography and Damage Evaluation through the Damage Rating Index Method

Pierre-Luc Fecteau and Benoît Fournier

17:00

Auditorium

CLOSING SESSION

Bruno Godart, Chair of Scientific Committee

Presentation of ICAAR 2024

António Batista, Chair of Organizing Committee

FRIDAY TO SUNDAY 3rd to 5th JUNE 2022

TECHNICAL VISIT

The 3 days trip covers various regions in the interior of the country, where visitors can enjoy the mountains, monuments, and old heritage cities and villages, such as Piodão schist village. Some have been included in the UNESCO list of World Heritage, as is the case of Batalha Monastery.

Some of the concrete structures to be visited (Yes! this is also in a Technical Tour) are near the Serra da Estrela, the highest peak in mainland Portugal with its endless landscapes and glacial lagoons, or in Naturtejo Geopark, a preserved area where several species of birds and animals live.

Finally and not less important, during these 3 days there are flavours for every palate to comfort the stomach and for raising the spirits excellent wines to taste from the demarcated region of Dão.

The cost of this technical visit is 400 € and includes transport, accommodation and meals. Registration is mandatory. The technical visit is limited to a maximum of 30 participants.

<http://icaar2020-2022.lnec.pt/tecvisit.html>



NOTES