

TC 281-CCC – Carbonation of concrete with supplementary cementitious materials

Meeting 8, Wednesday 8 September 2021, 13.00-17.00 (Brussels time!) online meeting

Zoom link:

<https://ugent-be.zoom.us/j/99971339326?pwd=SHNiMmtUWE9pK01kUzdxdTlZ2eHpadz09>

Meeting ID: 999 7133 9326; Passcode: 3yCt2DLU

Agenda

Welcome and update on membership

New member since last meeting: Christian Paglia (Institute of materials and construction, Mendrisio and University of Applied Sciences of Southern Switzerland)

Approval of the minutes of meeting 7, online, 21/04/2021

Feedback on the status of the working group activities by the working group chairs or their representatives / presentations related to the WG work

WG4: Effects of combined actions: load + carbonation (Juan Li, Ling Wang)

- Status of first and second round of the inter-laboratory comparison

WG1 and WG2: Correlation between atmospheric carbonation and carbonation induced by accelerated testing at high CO₂ concentrations / Effect of SCMs on natural and accelerated carbonation of blended Portland cements (Barbara Lothenbach, Elke Gruyaert, Philip Van den Heede, Stefanie von Greve-Dierfeld)

- Results of the inter-laboratory test and additional measurements (Elke Gruyaert, Hanne Vanoutrive, Philip Van den Heede)
- Status of the paper: Critical review of existing standardised test methods to determine carbonation resistance of concrete with supplementary cementitious materials (Susan Bernal)

WG3: Modelling of carbonation (Bruno Huet)

- Status of activities of WG3 and future plans

WG5: Effect of carbonation on corrosion of concrete with SCMs (Ueli Angst)

WG5 published a paper in RILEM Technical Letters, which has been shared with all TC members. There are no other planned activities for this WG.

WG6: Carbonation of alkali activated concrete (Gregor Gluth, Xinyuan Ke)

- Status of activities – carbonation of concrete with high volume of SCMs

WG6 has submitted a paper for the 75th RILEM Annual Week, and started to work on a final report of WG6 (i.e. a manuscript for submission to Materials and Structures or RILEM Technical Letters). Currently there are no new data and the content of the conference paper has been presented at the conference (regular talk).

Future activities and meetings:

Options:

- In person meeting (workshop), e.g. during the RILEM spring convention and 75 years of RILEM celebration in Paris or elsewhere, e.g. Ghent May 2022.
- LNEC will hold the ICAAR 2020-2022 - 16th International Conference on Alkali Aggregate Reaction in Concrete, 31 May – 2 June 2022 Lisbon (Isabel Martins). A TC workshop could be linked to it.
- Numerical modelling strategies for sustainable structures, 4-6 July 2022, Marseille, France, <https://sscs2022.sciencesconf.org/resource/page/id/5>

Miscellaneous

- All upcoming TC papers could be combined in a M&S topical collection (> 3 papers needed)
 - Critical review of existing standardised test methods to determine carbonation resistance of concrete with supplementary cementitious materials (lead: Susan Bernal)
 - Results of the inter-laboratory test – part accelerated carbonation (lead: Elke Gruyaert, Hanne Vanoutrive, Philip Van den Heede)
 - Results of the inter-laboratory test – part natural carbonation (lead: Elke Gruyaert, Hanne Vanoutrive, Philip Van den Heede)
 - Effects of combined actions: load + carbonation; inter-laboratory comparison (lead: Juan Li, Ling Wang)
 - Carbonation of alkali activated concrete / concrete with high volume of SCMs (lead: Gregor Gluth, Xinyuan Ke)
 - Others? Recommendation?

Closure

Meeting Minutes

Attendees (58): N. Alderete, C. Andrade, S. A. Bernal, A. Camões, Ö. Cizer, S. Chinchon-Paya, N. De Belie, V. Ducman, J.M. Etcheverry, M. Etxeberria, A. Fernandez-Jimenez, I. Garcia-Lodeiro, G. Geng, G. Gluth, C. Grengg, E. Gruyaert, G. Guoqing, Y. Huang, B. Huet, I. Ignjatovic, J.O. Ikotun, S. Kamali Bernard, X. Ke, S. Keßler, B. Li, J. Li, T.-C. Ling., Z. Liu, B. Lothenbach, J. Lu, A. Marsh, I. Martins, F. Moro, M. Nedeljkovic, I.J. Olumuyiwa, C. Paglia, R. Patel, J. Perko, E. Piolet, J. Provis, J. Sanchez, K. Sideris, X. Shi, Z. Shi, C. Thiel, P.Q. Tri, I. Tole, P. Van den Heede, L. Valentini, H. Vanoutrive, Y. Villagran Zaccardi, S. Von Greve-Dierfeld, A. Vollpracht, Y. Yao, G. Ye, L. Wang, Z. Wang, M. Zajac, C. Zhang, S. Zhutovsky.

Apologies: https://doodle.com/poll/zd9r2r8p9kbcimyq?utm_source=poll&utm_medium=link

Opening of the meeting by TC Chair Prof Nele De Belie, welcoming new TC members and discussing briefly changes in the meeting agenda, to consider time difference with some of the attendees

WG 4, on effect of loading in carbonation performance presented results of their ongoing interlaboratory testing (see presentation in TC folder in RILEM website). Specific highlights from the discussion included (L. Wang):

- Discussions of the ILT results:
 - Systematic differences between some laboratories results
 - Differences between SCMs
 - Choices of how to model the loading under carbonation effects
- This WG has a meeting scheduled in November 2021, after next set of results is expected from participating institutions.

WGs 1 and 2, on effects of accelerated and/or natural carbonation of materials with SCMs. During the meeting the results of the interlaboratory test and update on the progress made analysing such data were presented and discussed. Copy of the slides are available in the TC folder in the RILEM website. Specifically the following points were addressed during the discussion (E. Gruyaert, H. Vanoutrive):

- To-dos for all contributors (see slide deck):
 - Give feedback on draft article on accelerated carbonation ILT results (to be circulated in early October 2021)
 - Check details of testing methods stated in draft article against original versions of standards.
- Scope of the paper includes analysis of impacts of: cement type, curing, CO₂ concentration, aggregates.
- Bottom side and trowelled side carbonation results were excluded from further statistical analysis
- Issues: complete carbonation before 91 days, and variation in amount of repetitions.
- General conclusions:
 - Significant difference between water and sealed curing for each cement type and specimen type – sealed curing results in higher carbonation depths.
 - No general conclusions around the effect on CO₂ concentration.
 - Lower carbonation coefficient for mortar than concrete.
- Discussions of the ILT results:
 - Greater impact of curing for CEM I specimens which was surprising – would have expected greater difference for mixes with SCM contents? Outstanding question.
- Next experimental steps:
 - Evaluation of natural carbonation results.
 - Suggestion that one lab makes additional pastes and mortars, which are exposed to accelerated carbonation, then sent to other labs for advanced characterisation studies. Already had confirmation for participating labs.
 - These results would not fit into the first article on ILT accelerated carbonation results.
- Critical review of carbonation standards (A. Marsh)
 - ~80% of expected contributions have been received.
 - Executive decision made to complete article with the information received.
 - Anticipate that a first draft will be circulated to co-authors in October.

WG 3, on carbonation modelling are still developing a database of models, and invite all TC members to continue contributing to this initiative. During the meeting the following information was presented (B. Huet):

- Outline of article for carbonation modelling (this will be made available to WG members)
- Seeking input from those involved in modelling who haven't yet expressed interest.

WG5, on corrosion of steel rebars in concretes with SCMs (U. Angst)

- Article already published in RILEM TL (<https://letters.rilem.net/index.php/rilem/article/view/127>) – no further activities planned.

WG 6, carbonation of alkali-activated materials (G. Gluth & X. Ke)

- Made a presentation of WG activities so far at RILEM Week 2021 (PDF available in the folder of the TC in the RILEM website)
- Discussions:
 - Choice of whether to consider 'total CaO', or only 'reactive CaO'. It was highlighted that for these systems as there are no secondary sources of CaO (e.g. neither OPC nor limestone) are added to these binders, it makes sense to use the total CaO, particularly if binders are solely based on blast furnace slag.

Other business

- Since RILEM Spring Week 2022 will be largely online, considering a separate meeting in Ghent in 2022. Desirable to make this event part of a wider event/workshop.
- Topical collection in Materials & Structures soon to be confirmed. This will apply to all upcoming articles published by this TC, but will not apply retrospectively.

TC members congratulated our Chair recently being appointed Vice-President of RILEM.

Closure