

22ND CONFERENCE AND WORKSHOP ON RHEOLOGY OF BUILDING MATERIALS

REGENSBURG, GERMANY
MARCH 6–7, 2013

Conference Report II

After 22 years the Meeting on Rheological Measurements of Building Materials has become a firmly established, international event. On March 6th around 150 guests and speakers gathered in Regensburg for the seminar. The fourteen presentations covered several fields: From Fluid mechanics and microstructure of cement paste, processing, self compacting concretes, to admixtures and testing systems.

The lecture series was opened with a welcome address by Markus Greim, CEO of Schleibinger Geräte, and Wolfgang Kusterle, HS Regensburg. First speaker was Ameneh Schneider, Smartminerals GmbH, Vienna, Austria. She presented her researches on which factors influence rheological parameters of cement pastes. Binder was a cement type CEM I 42,5 R. Using a Viskomat NT rheometer basic rheological parameters as well as the plasticizer saturation were sounded out. Furthermore important values for the reproducibility of the measurements (w/c-value, mixing time, mixing profile and duration) were determined. In the main research program the following influences were examined: Grain size of the cement, sulphate agents of the cement, temperature during processing of the cement paste and chemical structure of the plasticizers available on the market. After Maurizio Belotto, Giovanni Bozzetto S.p.A Italy, and his presentation about "Cement paste rheology and microstructure" Ruprecht Vogel closed the first part of the lecture series. He carried out a critical evaluation on literature dealing with the topic of spherical particles sedimenting in fluids with yield point. The results presented show a discrepancy between certain research groups. Each one representing a certain point of view on the subject. Ruprecht Vogel states that, even though the different groups describe the same problem, the mathematical outcome has to be questioned. In conclusion he gave a preview to further experiments he will perform to underpin his statements.

A not so common constructing material are refractories, used for example in furnaces and cement kilns. Johannes Kasper, HS Koblenz, Germany, showed that the mixing quality of these materials may be optimized and predicted by rheological measurements. Beneath some standard methods he uses a rheometer with a spherical probe of 20 mm at low shear rates. Next up Klemens Laub, IAB Weimar, presented a rheological analysis of mortar for bore hole heat exchanger.

The application in this particular field demands certain requirements from a mortar which later will enclose the thermal probe. For the fresh mortar as for the cured one. Important properties for the fresh mortar are: High suspension stability, a low hydration heat and good back filling properties. Last one especially influenced by the water/solid ratio. The cured mortar is required to have a high thermal conductivity and durability. For there are pre-mixed mortar powders available it was evaluated how the mixing technique, length and intensity influence the previously named properties. Results show the possibility to adjust values like the viscosity and yield stress with the mixing process and the addition of water.

The afternoon session on the topic of "Rheology of water reduced eco-friendly concretes" was started by Moien Rezvani, TU Darmstadt, followed by Michat Drewniok, TU Gliwice, Poland, and the presentation on the research on "Consistency of SCC and its relationship with framework pressure". Later on Wolfram Schmidt, BAM Berlin, opened the section of "Admixtures". He presented simple methods to evaluate the influence of any PCE plasticizer on rheology. Luka Zevnik, TKK Sprenica, Slovenia, complemented the issue by his presentation on "Rheology of fresh concrete and the Influence of superplasticizers". In his project Egor Secrieru, TU Dresden, discussed the rheological behavior of cement-based mortars with and without modification by superabsorbent polymers (SAP). Two types of SAP having different water absorption and desorption behavior were used, while for one of them additionally the fineness of grading was varied. Further parameter under investigation included water-to-binder ratio, amount of superplasticizer and additions of silica fume. All mixes were tested by continuous flow rheometry. For the ease of comparison, slump flow was used as an empirical control test. It was found that not only the distinct chemical structure and water absorption and desorption behavior of SAP are the major factors governing the rheological properties of the mix, but also the SAP's different particle size distributions exhibit a great influence. Marc Schmitz, Dow Construction Chemicals, Walsrode, presented another type of chemical admixtures for concretes. Methyl-cellulose shows significant effects on concrete. Traceable to its chemical structure, functional groups and ability to absorb water.

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The last part of the conference dealt with technology around building materials. Comparing and evaluating measuring devices as well as finding new ways monitoring the parameters of readymixed concrete were topics of the last three presentations. Andraž Hocevar, IGMAT Ljubljana, compared rheological parameters of fresh SCC concrete mixtures measured with two different coaxial cylinder rheometers, ConTec Viscometer 5 and ICAR Rheometer. He measured yield stress and plastic viscosity of 12 different concrete mixtures. The non-portable ConTec Viscometer 5, which is coaxial cylinder rheometer, and the portable ICAR Rheometer, which is rotating impeller rheometer, assume Bingham model for the flow behavior description and apply Reiner-Riwlin equation for the calculation of fundamental results. Due to different geometries that these apparatuses apply, fundamental results obtained by measurements cannot be compared directly. It is well known that the water content of fresh concrete has a big influence in the rheology of fresh concrete. Heribert Müller, F. Ludwig GmbH, Mainz, presented a new measurement system for online measurement of humidity in the concrete mixing truck. In cooperation with Schleibinger Geräte, the HS Regensburg is developing a measurement system, to check the flow properties of SCC directly in the batch mixer in the concrete plant. Florian Fleischmann, HS Regensburg, presented some intermediate results of this project.

After the colloquium at March, 6th, like every year things are furthermore discussed in the evening, at a typical restaurant located in the historical city of Regensburg. With more than 60 participants the workshop for rheological measurements on March 7th also was well attended. First the basics of rheology are shown by some simple, but nevertheless impressive experiments, by O. Teubert, Schleibinger Geräte. Oscillation tests with a cement based mortar, showed the participants, how to handle building materials with a rheometer. Mr. Fleischmann from the HS Regensburg presented the newly developed concrete rheometer eBT2 as a collaboration project between the HS and Schleibinger Geräte. The 23th Regensburg colloquium and workshop will take place mid of March 2014 at the HS Regensburg. Most of the presentations are available online at <http://www.schleibinger.com/k2013/regen13US.html>

Figure 1 (left): Wolfgang Kusterle opening the 22nd Conference and Workshop on Rheology of Building Materials.

Figure 2: F. Fleischmann (Hochschule Regensburg) explaining the new eBT2 rheometer at the laboratory workshop.

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