8th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMA2022)
June 5-9, 2022, Oslo, Norway

COMPUTATIONAL ANALYSIS OF CONCRETE IN AN EXPERIMENTAL-VIRTUAL-LAB

TRACK NUMBER 1000 (COMPUTATIONAL SOLID MECHANICS)

J. SCHRÖDER[*], S. ANDERS[†], D. BRANDS[*], G. MESCHKE[#], M. KALISKE[§]

[*] Institut für Mechanik, Universität Duisburg-Essen, Germany
j.schroeder@uni-due.de; dominik.brands@uni-due.de; http://udue.de/mec

[†] Lehrstuhl Werkstoffe im Bauwesen, Bergische Universität Wuppertal, Germany
s.anders@uni-wuppertal.de; https://www.baustoff.uni-wuppertal.de

[#] Lehrstuhl für Statik und Dynamik, Ruhr-Universität Bochum, Germany
guenther.meschke@rub.de; https://www.sd.ruhr-uni-bochum.de/

[§] Institut für Statik und Dynamik der Tragwerke, Technische Universität Dresden, Germany
michael.kaliske@tu-dresden.de; https://tu-dresden.de/bu/bauingenieurwesen/sdt

Key words: concrete, reinforcement, damage, failure, microstructure, multiscale.

ABSTRACT

Nowadays, light, filigree, high-rise and resource-efficient structures are increasingly built using modern concretes. However, due to their dead weight they are susceptible to vibrations. Structures and components - such as long-span bridges for high-speed trains, wind-power plants - are also typically subjected to complex and variable loading histories as well as very high numbers of load cycles. The fatigue behavior of concretes and structural members is decisive for successful design and realization of such applications.

The aim of this mini-symposium is to bring together experts in material degradation of concrete, with a focus on capturing, understanding, describing, modelling and predicting the damage processes using the newest experimental and numerical methods. Closely coordinated approaches in Experimental-Virtual-Labs between experiment and computation are needed to extent knowledge for instance to very high numbers of cycles and to assess high-cycle fatigue behavior of new concrete mixes basing on short-term and low-cycle tests or other related degradation phenomena.

Topics of interest include (but not limited to) model-based description of the heterogeneous concrete microstructure (with and without fibers), damage and crack development at different scale levels and for different moisture conditions, multi-level and time-variant loading, cycle-jump approaches and prediction of damage evolution, from both, a material-science and a numerical-modelling point of view.

REFERENCES

[1] P. C. Aïtcin. *High-performance concrete*. E & FN Spon, London, 1998.

[2] Y. Malier, editor. “High-Performance Concrete: From material to structure”, E & FN Spon, London, 1998.

[3] J. Zhang, L. Ma, and Z. X. Zhang. “Elastoplastic damage model for concrete under triaxial compression and reversed cyclic loading”, Strength of Materials, 50(5):724–734, 2018.

[4] J. Storm, M. Pise, D. Brands, J. Schröder, and M. Kaliske. “A comparative study of micro-mechanical models for fiber pullout behavior of reinforced high performance concrete”, Engineering Fracture Mechanics, 243:107506, 2021.