Mechanics of concrete and reinforced concrete structures:
(from material heterogeneities to structural failure with size effect)

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In this work we address several issues pertaining to efficiency of the computational approach geared towards modeling of inelastic behavior of concrete as a heterogeneous material with microstructure, which is represented by a multiscale model. We elaborate upon the case where the scales remain coupled throughout the computations, implying a constant communication between the finite element models employed at each scale.

We also discuss different manners of representing a complex multi-phase microstructure within the framework of the finite element model constructed at that scale, selecting a model problem of two-phase material where each phase has potentially different inelastic behavior.

The uncertainty aspects are also taken into account pertaining to the incomplete information on the material heterogeneities. The latter is presented as an alternative strategy for bridging the scales, which allows replacing the phenomenological model with random fields for parameters.

Further details can be found in our recent works [1,2,3,4,5,6,7,8].

References

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