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IMB MPA CMM KARLSRUHE

Masterarbeit (MA)

Multiscale modeling of elastic modulus and strength of the concrete with recycled aggregates

Background/Problem:

The construction industry faces growing pressure to reduce its environmental impact, particularly the high CO_2 emissions associated with cement production and the depletion of natural aggregates. At the same time, large volumes of concrete waste are generated from demolition activities, much of which is landfilled. Recycled concrete aggregates (RCA) promising pathway toward more sustainable concrete.

However, due to the presence of a layer of old mortar or paste on the aggregates, which is often weaker compared to the aggregates (weaker interfacial zones) (Figure 1), this adhered mortar/paste layer on the RCA can negatively affect concrete properties (strength and modulus).

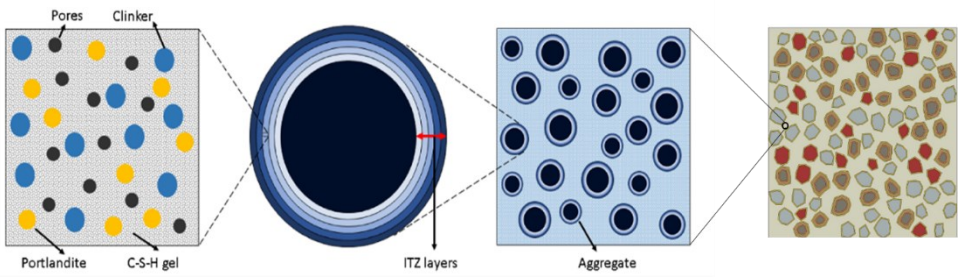

Figure 1: Overview of the multiscale modeling for concrete

As limited experience exists on the use of such materials, the goal of this study is to utilize a multiscale modeling framework to estimate the mechanical properties of concrete containing recycled aggregates. To this end, analytical homogenization will be utilized, and different methodologies to account for adhered mortar/paste will be systematically evaluated. At the KIT IMB/MPA numerical modeling and digitalization research group, we have developed a framework for multiscale modeling of concrete, where different schemes have *already been implemented* and made available for the user.

Objectives:

- Comparison of the elastic modulus of concrete for different aggregate content, coating thickness, and interfacial zone stiffness.
- Comparison of the stress and strain in different components of the concrete. with a numerical model that can be implemented in ABAQUS

Learning and skill development:

The student will learn micromechanical modelling of recycled aggregate concrete, compare analytical homogenization schemes, utilization of FEM tools for multiscale modelling, and interpret stress–strain distributions considering interfacial zones and material heterogeneity.

Kontakt

Für nähere Informationen und weitergehende Fragen wenden Sie sich bitte an:

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