

Single- and two-scales sharp-interface models for concrete

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There is a need to design durable concrete structures. A fundamental understanding of the deterioration phenomena is therefore vital. Concrete carbonation is one of the most common ways in which reinforced concrete buildings can be damaged. In this talk I will present a one-dimensional model that predicts concrete carbonation. In the physically relevant limit of a fast bulk reaction, a matched asymptotic approach is used to derive sharp interface models that correspond to different scalings in the small parameter. The resulting models give one-phase and two-phase Stefan moving-boundary problems with interface conditions determined by a micro problem. This micro-macro moving boundary problem will be discussed in three conceptually different regimes for the diffusivities of the driving chemical species.