DTU Byg
Institut for Byggeri og Anlæg

INNOVATION DAY 2013

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Multi-Physics Modeling of Porous Materials

Porous materials are a widely used class of materials used in different areas, e.g. materials science, chemical engineering, soil mechanics, and bio mechanics. The research within porous materials is therefore applicable across different research fields and subjects. The advantages from the generalized approach are seen in this study, where a modeling tool is developed for cement based materials. This model can be directly used for e.g. groundwater simulations and other reactive porous systems.

Mass Transport

- Diffusion of ions
- Electromigration
- Moisture transport
- Sorption hysteresis
- Diffusion of gasses

Chemical Equilibrium

- Water reactions
- Pure phases
- Solid solution
- Surface complexation

Mechanical effects

- Plasticity
- Fracture mechanics
- Growth

Math toolbox

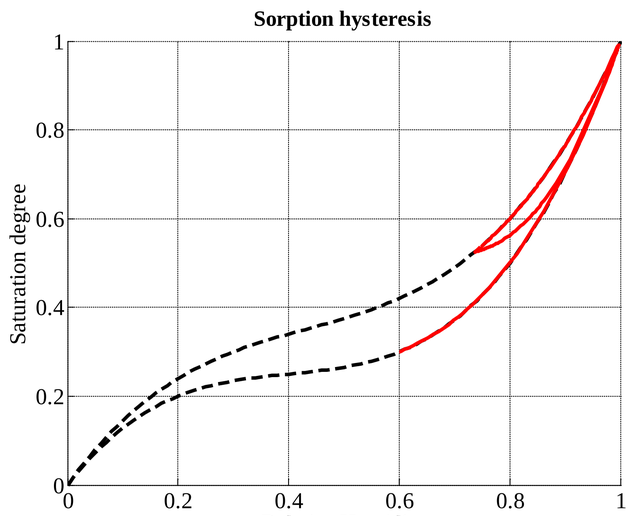
Programming

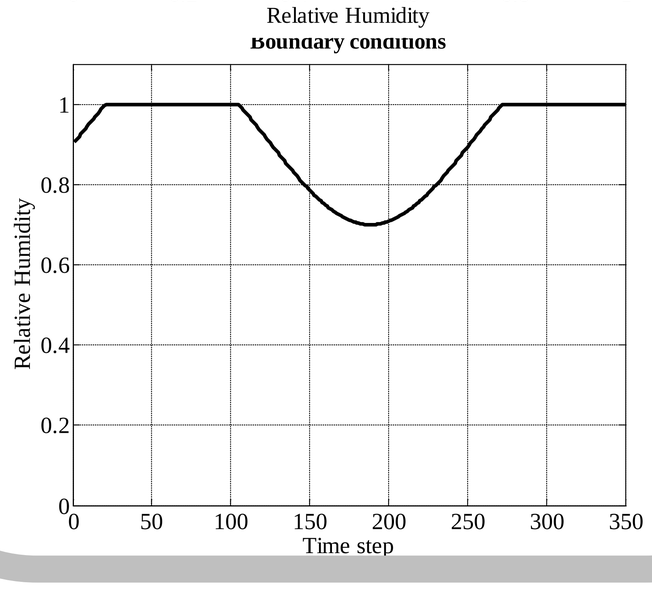
Model output:

-Material design
-Durability
-Service life
-Optimization
-Support experimental work
-Monitoring systems

Sorption Hysteresis

Periodic boundary conditions of vapor and liquid phases on concrete





Coupled model results

Phase changes in cement paste due to sea-water exposure.