

Stiffness and Strength of Mature Dental Pastes

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Objectives:

In this project, validated multiscale models for construction cement pastes are extended to dental cement pastes to upscale stiffness and strength from microscopic scale to application scale.

Strength in dental cement pastes

Strength and stiffness are some of the most important qualities in cementitious materials. Dental cement pastes have higher compressive strengths and stiffness than ordinary Portland cement pastes used in construction sites. This proves a key opportunity to understand the microstructure features that drive the macroscopic properties.

What are the experimental techniques used?

Grid nanoindentation characterizes the mechanical properties of the individual phases in the cement paste. Ultrasonic pulse transmission and uniaxial compressive strength tests are used to investigate the macroscopic stiffness and strength, respectively. Insight on particle size distributions of the material is provided by scanning electron microscopy (SEM), and dispersive X-ray spectroscopy found in literature.

What is the goal of multiscale modelling?

The main goal of multiscale strength and stiffness modelling is to obtain homogeneous macroscopic material properties based on some relevant features of the microstructures. Once the microstructure properties in the multiscale model are set correctly, the computed results will correspond with the strength and stiffness that were determined by the experimental techniques.

