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Long-Term Stress–Strain Relations of the Cement-Matrix Composite

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A micromechanics-based model is proposed to determine the nonlinear stress–strain relations of the cement-matrix composites due to the effects of the volume concentrations and the material ages. When the nonlinear stress–strain curve of the binders is determined by means of the four-parameter Burgers model at different material ages, the secant moduli of the nonlinear binders are then used in a two-phase composite model to find the overall secant moduli of the composite as a function of the volume concentration and the shape of the aggregates. The results show that the predicted stress-strain relations of the mortar depending on the material ages are suitable for the volume concentration up to 70% of the aggregates and the range lower than 80% the peak strength of the composite.

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