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FRACTURE, DAMAGE AND FAILURE MECHANICS OF CEMENTITIOUS MATERIALS

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ABSTRACT

Cementitious materials underpin civil engineering infrastructure, and understanding their fracture, damage, and failure mechanisms is essential to meet today's requirements for durability, service life, and sustainable design. This symposium provides a concise overview of current advances and emerging directions in the mechanics and modelling of cement-based materials. Topics include:

- Fracture and damage mechanics in cement-based materials, including heterogeneity effects.
- Multi-scale and computational modelling linking micro/meso/macro behaviour.
- Durability and environmental/time-dependent degradation (freeze–thaw, chemical attack, long-term loading).
- Fibre-reinforced concrete (FRC) and other advanced cementitious materials, including ultra-high-performance concrete (UHPC), under varied loading regimes.
- Emerging technologies and resilience strategies, including 3D-printed cementitious materials, self-healing mechanisms, and non-destructive testing/monitoring for predictive maintenance.
- High-value utilization of industrial solid wastes (e.g., coal gangue, recycled aggregates) in low-carbon cementitious composites.