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3D MODELING OF CEMENTITIOUS MATERIALS AND APPLICATIONS IN CIVIL ENGINEERING

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GINAUCA MAZZUCCO* AND BEATRICE POMARO*

* Department of Civil, Environmental and Architectural Engineering, University of Padova,
Via F. Marzolo 9, 35131, Padova, Italy
E-mail address: gianluca.mazzucco@dicea.unipd.it, beatrice.pomaro@dicea.unipd.it
www.dicea.unipd.it

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ABSTRACT

Today the scientific advancements in the fields of material behavior modelling and of structural analysis procedures based on computational methods make possible to carry out the integrity and safety assessment of cementitious materials even under severe stress states, close to failure. Research in this field is justified by the necessity to answer to durability issues, often connected to the occurrence of catastrophic events like earthquakes or other cyclic/random loads, for which a reliable definition of the collapse mechanism encompasses the study of crack initiation and propagation in order to provide useful guidelines for retrofitting/strengthening measures aimed at the preservation of existing structures. Cementitious materials, like concrete and masonry, can be investigated conveniently over a wide stress state as an elastic-plastic-damaged material potentially undergoing fracture. Therefore robust nonlinear numerical models are requested to catch reinforced and unreinforced post-peak behavior or fracture under 3D complex stress states. The modeling strategies can range from discrete models, simulating the material as a composite, to continuous homogenized texture models, which can be computationally more efficient at the structural scale, in both probabilistic and deterministic approaches.

The main aim of this Mini Symposium is to gather researchers specialized in computational mechanics applied to cementitious materials, namely concrete and masonry at the material and structural scale.

Authors are encouraged to present their innovative contributions in the field of theoretical and numerical models of sound constitutive laws for predicting the mechanical behavior of cementitious materials under service loads as well as ultimate loads, even close to collapse.

The aspects related to 3D solid and numerical modeling will play a central role, while still highlighting the underlying conceptual and theoretical bases.

Applications from all aspects of structural engineering will be considered, with particular attention to those addressing structural retrofitting, rehabilitation of existing buildings and heritage, as well as durability issues related to the main decay mechanisms connected to cementitious materials.

The studies are not limited to conventional materials but are open to cementitious materials in combinations with polymers, metallic fibers, improved mixtures/components, as well as eco-sustainable materials.

The modeling approaches may be inscribed in the framework of continuous or discrete mechanics, poromechanics or homogenized scale, and coupling between multiphisics phenomena may be taken into account, in relation to the specific scenario under study.

Solid modeling may involve CAD, reverse engineering, ad hoc algorithms or other approaches considered of interest in the generation of the 3D models.