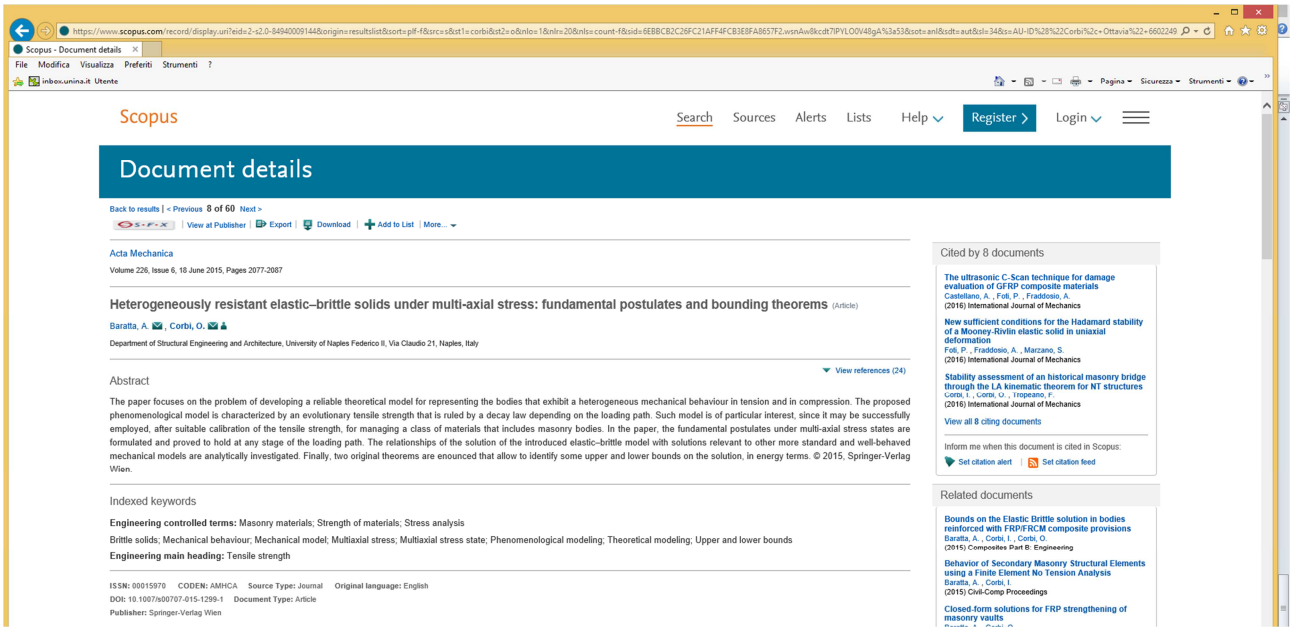

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Heterogeneously resistant elastic–brittle solids under multi-axial stress: fundamental postulates and bounding theorems (Article)

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Abstract

The paper focuses on the problem of developing a reliable theoretical model for representing the bodies that exhibit a heterogeneous mechanical behaviour in tension and in compression. The proposed phenomenological model is characterized by an evolutionary tensile strength that is ruled by a decay law depending on the loading path. Such model is of particular interest, since it may be successfully employed, after suitable calibration of the tensile strength, for managing a class of materials that includes masonry bodies. In the paper, the fundamental postulates under multi-axial stress states are formulated and proved to hold at any stage of the loading path. The relationships of the solution of the introduced elastic–brittle model with solutions relevant to other more standard and well-behaved mechanical models are analytically investigated. Finally, two original theorems are enounced that allow to identify some upper and lower bounds on the solution, in energy terms. © 2015, Springer-Verlag Wien.

Indexed keywords

Engineering controlled terms: Masonry materials; Strength of materials; Stress analysis

Brittle solids; Mechanical behaviour; Mechanical model; Multiaxial stress; Multiaxial stress state; Phenomenological modeling; Theoretical modeling; Upper and lower bounds

Engineering main heading: Tensile strength

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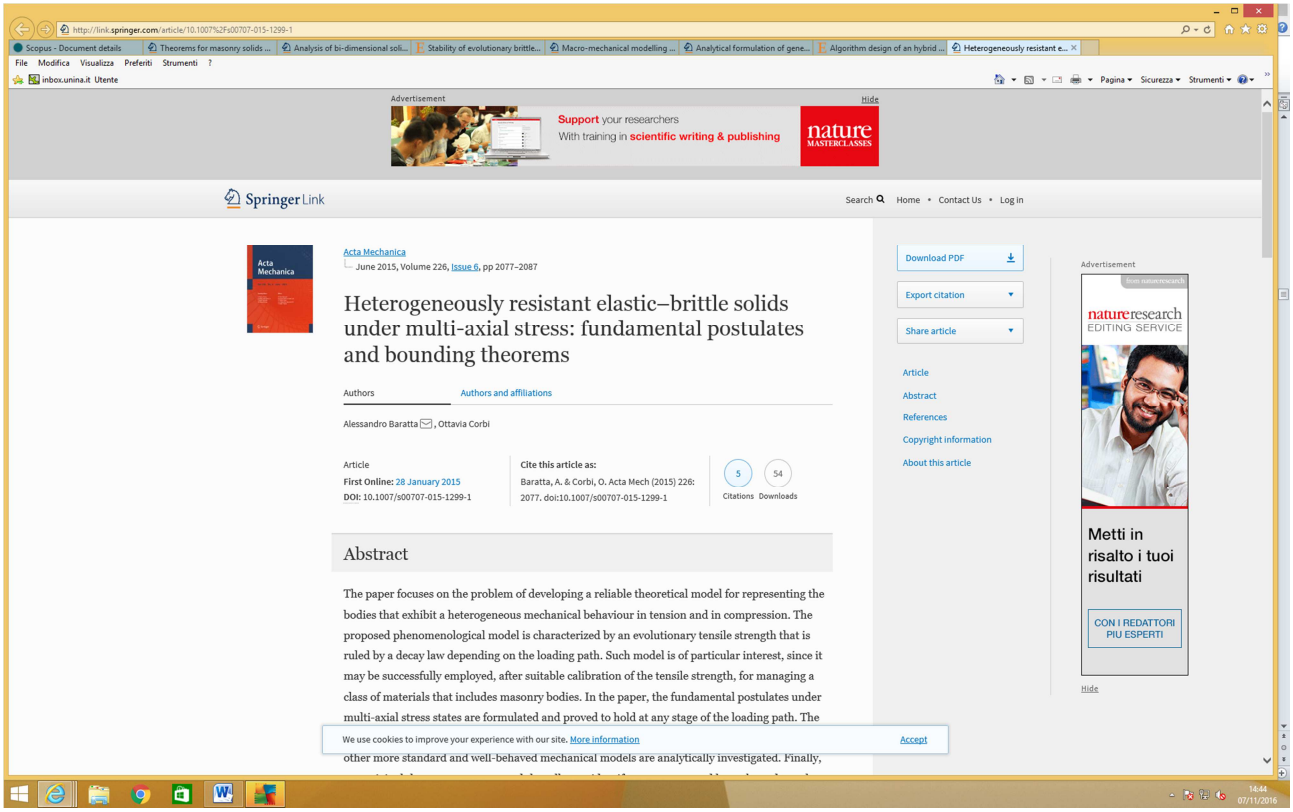

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Heterogeneously resistant elastic–brittle solids under multi-axial stress: fundamental postulates and bounding theorems

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Abstract

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