14th World Congress on Computational Mechanics (WCCM XIV)
8th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2020)
July 19- 24, 2020, Paris, France

NEW TRENDS IN THE HOMOGENIZATION OF NONLINEAR COMPOSITES

TRACK NUMBER 300

S. MARFIA[*], S. REESE[†], K. SAB[#] AND E. SACCO[+]

[*] Department of Engineering, University of Roma Tre, Via Vito Volterra, 62, 00146 Rome, Italy
sonia.marfia@uniroma3.it

[†] Institute of Applied Mechanics, RWTH Aachen University,
Mies-van-der-Rohe-Str. 1, D-52074 Aachen
stefanie.reese@rwth-aachen.de

[#] Université Paris-Est, Laboratoire Navier, CNRS UMR 8205, ENPC, IFSTTAR,
6 et 8 avenue Blaise Pascal, 77455 Marne-la-Vallée Cedex, France
karam.sab@enpc.fr

[+] Department of Structures for Engineering and Architecture, University of Naples Federico II
Via Claudio, 21 - 80125 - Naples, Italy.
elio.sacco@unina.it

Key words: Composites, Nonlinear response, Homogenization, Reduced Order Model.

ABSTRACT

Composites materials are becoming more and more popular in many fields of engineering due to their high performance properties such as lightweight and high resistance. A composite is a material obtained combining two or more constituents with significantly different physical or chemical properties. A large class of composite materials is characterized by different types of nonlinearities depending on the nature of the constituents; in fact, their mechanical response can be influenced by damage, fracture, plastic, viscous phenomena, phase transformation, etc. that have to be properly modeled. Furthermore, composite materials often present internal complex microstructures; therefore, they require specific formulations to be developed in order to take into account the mechanical behavior of each component and its topological distribution.

Analytical and computational homogenization approaches aim to determine the effective behavior of complex and highly heterogeneous materials, taking into account the nonlinear processes occurring at the microstructural level.

The minisymposium focuses on the **new trends in the homogenization of nonlinear materials**. The goal is to provide a forum for communications and interactions on (but not limited to) the following topics: constitutive modeling of heterogeneous materials at the microscale; modeling of heterogeneous materials with coupled multi-physics behavior (e.g. phase change, nonlinear thermo-mechanics...); micromechanics of materials characterized by complex microstructures; computational homogenization of heterogeneous, linear, nonlinear and time-dependent materials; reduced order approaches aimed to limit the computational costs in the framework of multiscale analysis; computational homogenization including higher-order continuum models; domain decomposition approaches.