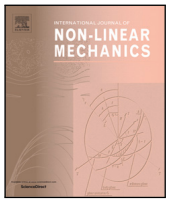
International Journal of Non-Linear Mechanics 126 (2020) 103568

Contents lists available at ScienceDirect

International Journal of Non-Linear Mechanics

journal homepage: www.elsevier.com/locate/nlm



Preface

Preface to the Special Issue of the International Journal of Non-Linear Mechanics on Nonlinear theory of electro- and magneto-elasticity

The topic of Soft Matter is one of the frontiers and hotspots of engineering science in the 21st century. Flexible structures based on soft matter have the advantages of high-sensitivity, low noise and large actuation strain, and are bound to become a core technology for the next generation of functional devices. Among them, soft electro- and magneto-active elastomers are some of the most promising smart soft materials. They have the capacity of converting mechanical energy into electromagnetic energy and vice-versa. This makes their deformations intelligent and controllable, thus paving the way for promising applications in soft robots, flexible actuators, energy harvesters, and soft biomedical devices.

"*We need some theory when we think of soft materials*", as Pierre-Gilles de Gennes, the founding father of Soft Matter, said in his Nobel Prize lecture. Non-linear analysis and modelling of soft electro- and magneto-active materials and structures are quite complex fields of research, due to strong nonlinearity and electro- and magneto-mechanical couplings. Early research efforts in the modelling of electromagnetic continuum mechanics focused on creating an appropriate theoretical framework of nonlinear coupled field theory. Much progress has been made since, especially from the start of this century. Indeed, extensive applications of electromagnetic materials have promoted and accelerated the development of this research endeavour, especially in its experimental and computational aspects.

With this Special Issue we aim at summarizing the present state-of-the-art, bringing new ideas and concepts to the fore, and promoting research in the mechanics of electromagnetic elastomers in general, by putting together a collection of articles from leading experts in the field. The collected ten papers in the issue cover several aspects of the current research, including constitutive modelling, design of actuators based on electromagnetic elastomers, instabilities, vibrations, experimental characterization and rupture failure. We hope that they will foster new perspectives and research.

We are most grateful to the Editor-in-Chief, the authors, the anonymous reviewers, and the support staff at Elsevier for the effort and time involved in bringing this Special Issue to fruition.

Yipin Su
Department of Civil and Environmental Engineering, University of Southern California, USA
E-mail address: yipinsu@usc.edu.

Michel Destrade *
School of Mathematics, Statistics and Applied Mathematics, NUI Galway, Ireland
E-mail address: michel.destrade@nuigalway.ie.

Weiqiu Chen
Department of Engineering Mechanics, Zhejiang University, PR China
E-mail address: chenwq@zju.edu.cn.

* Corresponding author.

https://doi.org/10.1016/j.ijnonlinmec.2020.103568

Available online 29 July 2020
0020-7462/