Acta Mechanica Solida Sinica, Vol. 34, No. 6, December, 2021, 781–782 ISSN 1860-2134
https://doi.org/10.1007/s10338-021-00299-9

Preface to the Special Issue on the Dynamic Behaviors and Energy Absorption of Materials and Structures

Jin Qian[1⋆] **Ronghao Bao**[1⋆] **Weiqiu Chen**[1⋆]

([1] *Department of Engineering Mechanics, Key Laboratory of Soft Machines and Smart Devices of Zhejiang Province, Zhejiang University, Hangzhou 310027, China*)

Received 2 November 2021; revision received 19 November 2021; Accepted 19 November 2021;
published online 9 December 2021

In this themed issue of Acta Mechanica Solida Sinica (AMSS), leading experts and researchers are joining together to celebrate Professor Tongxi Yu's 80th birthday and pay tribute to his distinguished career spanning over five decades, devoted to pioneering research in the fields of impact dynamics, plasticity, energy absorption, textile and cellular materials, nano-composites, etc. Professor Yu has been a much-admired teacher, a mentor and a friend to all who worked with him throughout his career, and this collection of articles is contributed by people who have had association with Professor Yu as colleagues, students, postdocs or collaborators.

The selected 15 papers in this special issue focus on either the fundamental mechanics or the cutting-edge technologies on the dynamic behaviors and energy absorption of materials and structures, as outlined in the following. Liu and coworkers [1] overviewed the historical achievements and theoretical perspectives on the propulsion mechanisms and associated dynamic behaviors of natural and artificial micro-swimmers. Zhao and coworkers [2] investigated the antisymmetric plate wave by involving linear defects in phononic crystals, providing insightful clues for the design of topological edge states. Xu and coworkers [3] proposed an energy absorption strategy by using the two-staged square sectional combined energy absorption structure with local surface nanocrystallization. Li and coworkers [4] performed a combined theoretical and computational study on the physical mechanism of multiple impact phenomena that occurred in impact hammer testing. Xing and coworkers [5] used a bond-based peridynamic theory to propose a one-dimensional nonlocal continuum model, elucidating the equilibrium and propagation dynamics of defects in a solid. Huang and coworkers [6] proposed a multifunctional structural battery system comprising cylindrical battery cells, surrounded by lightweight and impact-resistant lattice metamaterial. Liu and coworkers [7] proposed a novel porous metamaterial structure, exhibiting an improved acoustic energy absorption performance at high temperatures and in the low-frequency range. Sherman and coworkers [8] established numerical and theoretical models to analyze the superior energy absorption performance of bio-inspired honeycombs subjected to external dynamic loading. Zhu and coworkers [9] developed a dynamic viscoelastic model that captures the experimentally revealed rate- and temperature-sensitive behaviors of frozen soil at high strain rates. Yu and coworkers [10] examined the energy dissipation and impact resistance of solid-liquid composites, which can be tuned by regulating the viscosity and volume fraction of the liquid inclusions to satisfy the requirements. Chen and coworkers [11] provided a complete solution of large plastic deformation of square plates under exponentially decaying pulse loading, through the combination of saturation analysis and membrane factor method. Liu and coworkers [12] experimentally and numerically studied the dynamic response and energy absorption performance of foam-filled tubes under lateral external

⋆ Corresponding authors. E-mails: jqian@zju.edu.cn; brh@zju.edu.cn; chenwq@zju.edu.cn

blast loading. Bai and coworkers [13] presented a numerical model for the thermal-elastohydrodynamic lubrication of heterogeneous materials in impact motion. Wang and coworkers [14] developed a new electrical power generation device based on the high-frequency dynamic piezoelectric shear deformation under friction. Riabokon and coworkers [15] employed controllable quasi-static and dynamic uniaxial loading scenarios to experimentally reveal the nonlinearity of New Red Sandstone.

We thank all the authors and reviewers for their contributions, efforts and time that assembled this special issue, and particularly, the team of AMSS Editorial Department for making it possible.

References

[1] Liu J, Fu Y, Liu X, Ruan H. Theoretical perspectives on natural and artificial micro-swimmers. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00260-w.

[2] Zhao J, Yuan W, Yang F, Zhong Z. Valley-chiral edge states of antisymmetric plate wave in phononic crystals with linear defect. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00252-w.

[3] Xu X, Qu J, Li T, Tong Z, Zhao Z, Zhou Z. An optimal design of the two-staged square sectional combined energy absorption structure with local surface nanocrystallization. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00272-6.

[4] Li J, Lin K, Hu Y, Yang Y, Wang Y, Huang Z. Multiple impact phenomenon in impact hammer testing: theoretical analysis and numerical simulation. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00248-6.

[5] Xing J, Wang J, Wang L. A peridynamic model for the dynamics of defects with asymmetric potential wells. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00270-8.

[6] Huang Y, Guo W, Jia J, Wang L, Yin S. Novel lightweight and protective battery system based on mechanical metamaterials. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00249-5.

[7] Liu Q, Liu X, Zhang C, Xin F. High-temperature and low-frequency acoustic energy absorption by a novel porous metamaterial structure. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00253-9.

[8] Sherman J, Zhang W, Xu J. Energy absorption performance of bio-inspired honeycombs: numerical and theoretical analysis. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00262-8.

[9] Zhu Z, Tang W, Kang G. Dynamic deformation of frozen soil at a high strain rate: experiments and damage-coupled constitutive model. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00273-5.

[10] Yu M, Li X, Lv P, Duan H. Solid-liquid composites with high impact resistance. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00277-1.

[11] Chen F, Tian L, Yu T, Zhu L. Complete solution of large plastic deformation of square plates under exponentially decaying pulse loading. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00280-6.

[12] Liu Z, Zhang T, Li S, Lei J, Wang Z. Experiment and numerical simulation on the dynamic response of foam-filled tubes under lateral blast loading. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00285-1.

[13] Bai X, Dong Q, Zheng H, Zhou K. Modelling of non-Newtonian starved thermal-elastohydrodynamic lubrication of heterogeneous materials in impact motion. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00284-2.

[14] Wang P, Xiao Y, Wu N. Electrical power generation using dynamic piezoelectric shear deformation under friction. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00291-3.

[15] Riabokon E, Poplygin V, Turbakov M, Kozhevnikov E, Kobiakov D, Guzev M, Wiercigroch M. Nonlinear Youngs modulus of new red sandstone: experimental studies. Acta Mech Solida Sin. 2021. https://doi.org/10.1007/s10338-021-00298-w.