

## **Auxetics and other systems of “negative” characteristics**

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## Auxetics and other systems of “negative” characteristics - Preface

This is the eleventh issue of *Physica Status Solidi (b)* focussed on materials and models exhibiting negative Poisson's ratio (PR), called *auxetics*, and other systems of „negative” characteristics [1]. It contains 22 papers, from which the first 17 papers concern auxetics, the following 4 are related to negative stiffness, and the last paper describes auxetic-like magneto-elastic effect.

The issue starts from the paper by *Chan Soo Ha, Michael E. Plesha, and Roderic S. Lakes* describing a chiral, isotropic model with negative Poisson's ratio. The following paper by *Teik-Cheng Lim* presents another macroscopic model of auxetic properties. The elastic properties of hexagonal auxetics under pressure are discussed by *Robert V. Goldstein, Valentin A. Gorodtsov, and Dmitry S. Lisovenko*.

Experimental studies of temperature, pressure and time influence on induction of auxetic response in needle-punched nonwovens is described by *Prateek Verma, Meisha L. Shofner, Angela Lin, Karla B. Wagner, and Anselm C. Griffin*. *Kim Alderson, Shonali Nazare, and Andrew Alderson* discuss large-scale extrusion of auxetic polypropylene fibre.

The next six papers present microscopic models of auxetics. *Duc Tam Ho, Soon-Dong Park, Soon-Yong Kwon, Tong-Seok Han, and Sung Youb Kim* discuss negative Poisson's ratio in cubic materials along principal directions. *D. S. Lisovenko, J. A. Baimova, L. Kh. Rysaeva, V. A. Gorodtsov, A. I. Rudskoy, and S. V. Dmitriev* analyse elastic properties of diamond-like carbon nanostructures with cubic anisotropy. *Viet Hung Ho, Duc Tam Ho, Soon-Yong Kwon, and Sung Youb Kim* study negative Poisson's ratio in periodic porous graphene structures. *S. V. Dmitriev, E. A. Korznikova, D. I. Bokij, and K. Zhou* demonstrate auxeticity resulting from nonlinear vibrational modes in a planar honeycomb lattice. *Mikołaj Bilski and Krzysztof W. Wojciechowski* simulate purely entropic planar systems of low symmetry to illustrate a possibility of tailoring Poisson's ratio by introducing auxetic layers. *Jakub Narojczyk, Mikołaj Kowalik, and Krzysztof W. Wojciechowski* consider the influence of nanochannels on Poisson's ratio of aperiodic (degenerate) crystal of hard dimers.

Auxetic composites are the subject of the following six papers. *Lin Zhou, Jiang Lili, and Hong Hu* describe auxetic composites made of three-dimensional textile structure and polyurethane foam. *Igor Shufrin, Elena Pasternak, and Arcady V. Dyskin* analyse deformations of reinforced-core auxetic assemblies by close-range photogrammetry. *Tomasz Strek, Hubert Jopek, and Agnieszka Fraska* discuss torsions of elliptical composite beams with auxetic phase. *Hubert Jopek* studies bending of a fibrous composite reinforced with auxetic phase by computer simulations. *H. Mohanraj, S. L. M. Filho Ribeiro, T. H. Panzera, F. Scarpa, I. R. Farrow, R. Jones, A. Davies-Smith, C. D. L. Remilat, P. Walters, and H.-X. Peng* present hybrid auxetic foam and perforated plate composites for human body support. *Tomasz Strek, Hubert Jopek, and Eligiusz Idczak* design two-phase auxetic structures by numerical optimization techniques.

Another four papers discuss the phenomenon of negative stiffness (or compressibility). Stability of two-dimensional discrete mass-spring systems with negative stiffness springs is studied by *Maxim Esin, Elena Pasternak, and Arcady Dyskin*. *Daphne Attard, Roberto Caruana-Gauci, Ruben Gatt, and Joseph N. Grima* discuss negative linear compressibility in models consisting of rotating rigid units. Nano networks exhibiting negative linear compressibility are considered by *Joseph N. Grima, Edera P. Degabriele, and Daphne Attard*. Effects of negative stiffness on bulk and shear responses of ferroelastic materials via phase field modelling in two dimensions are described by *Yun-Che Wang and Meng-Wei Shen*.

Finally, *Ganesh Raghunath, Alison Flatau, Hui Wang, and Ruqian Wu* present and discuss experimental data and computer simulation results which reveal magnetoelastic auxetic-like behaviour in galphenol.

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- [1] K. W. Wojciechowski, F. Scarpa, J. N. Grima, A. Alderson, *Phys. Status Solidi B* **252**(7),1421–1425 (2015).