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## ABSTRACT:

### Compressive Behavior of Closed-Cell Polymeric Foams by Means of a Dynamic and Rotation-Free Micromorphic Formulation

F. Concas<sup>1</sup>, M. Groß<sup>1</sup>

<sup>1</sup>Technische Universität Chemnitz, Professorship of Applied Mechanics and Dynamics,  
Reichenhainer Straße 70, D-09126 Chemnitz, Germany.

Closed-cell polymeric foams are used nowadays in several applications thanks to their remarkable mechanical properties and lightweight. Due to their particular microstructure, polymeric foams exhibit three stages under uniaxial compression at low and high strain rates [1]: a first linear elastic stage, followed by a plateau and a final densification stage. Suitable continuum models and dynamically consistent numerical procedures are crucial for simulating the mechanical behavior of such material in the dynamic range.

In order to model the behavior of closed-cell polymeric foams under compression, we implemented a micromorphic model in our dynamic numerical framework, which is based on the principle of virtual power. In such a micromorphic continuum the micro-rotations are deactivated, but in comparison to a microdilantant continuum [2], micro-deformations are possible only in a specific direction due to the microstretch tensor, which is formulated like the step length tensor of nematic liquid crystal elastomers [3]. The used numerical algorithm conserves the linear momentum and the angular momentum associated with the deformation mapping.

[1] F. Rahimidehgolan, P. Mohammadkhani, J. Magliaro and W. Altenhof, *Eur. J. Mech. Solids*, 104, 105212 (2024). a

[2] R. Jänicke, S. Diebels, H.-G. Sehlhorst and A. Düster, *Continuum Mech. Thermodyn.* 21, 297-315 (2009).

[3] M. Warner and E.M. Terentjev, in *Liquid Crystal Elastomers*, p. 56, Oxford University Press (2007).