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CLUSTER OF EXCELLENCE PROGRAMMABLE MATERIALS

V1_Dec21

International Conference on Programmable Materials

Hybrid Event, 12-14 July 2022, Berlin

Symposium: Mechanical Metamaterials & Structural and Functional Optimization

Chairs: Heiko Andrä, Chris Eberl

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Elastodynamic metamaterials have unusual mechanical properties mainly due to their internal structure, which is often composed of an array of unit cells. Thus, although they are built on the same principle as biological structures, they are less robust and cannot adapt to changing environmental conditions. New manufacturing techniques combined with new multiscale structure optimization methods make it possible to develop and manufacture mechanical metamaterials with variable, locally optimized unit cells. Such metamaterials can change or adapt their mechanical properties reversibly upon a change of an external field according to a prescribed program, similar to biological structures.

Furthermore, with the rapid development of additive manufacturing technologies (3D printing) it is possible and also necessary to optimize the outer shape simultaneously with the local inner structure of the material in the design process.

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In many applications the variation and the switching of the mechanical properties by an external trigger (e.g. external mechanical load, temperature change, electro-magnetic field) are desirable. Such problems occur, for example, in the following cases

- **Programmable elastic stiffness, viscoelastic damping, or coefficient of thermal expansion**
- **Programmable shape changing**
- **Bionic functional structures, e.g. mechanical sensors**
- **Microstructures produced by 3D printing of polymers or metals**

Our symposium focuses on methods (algorithms, theoretical background, extensions in the fields of mechanics) for the design and optimization of mechanical metamaterials and programmable materials that go beyond pure lightweight structures. The purpose of the symposium is to promote the discussion between researchers working on the methods itself and researchers or practitioners applying such methods for new applications.

Why attend?

- Top-class plenary talks
- Five symposia in three parallel sessions with invited talks on the following topics:
  - Mechanical Metamaterials & Structural and Functional Optimization
  - Polymers with sequence control
  - Shape Memory Polymers & Programmable Property Profiles
  - Design Ideas from Nature
  - Living Materials Systems
- Live and virtual poster presentations
- Panel discussions
- Conference Dinner

Registration and the call for poster presentations will start soon, we will keep you informed.

For further information please check our webpage at www.progmatcon.com

Conference Chairs:

- Prof. Dr. Peter Gumbsch, Fraunhofer IWM
- Prof. Dr. Alexander Böker, Fraunhofer IAP
- Prof. Dr. Chris Eberl, Fraunhofer IWM

Conference Organization: Fraunhofer Cluster of Excellence Programmable Materials, www.cpm.fraunhofer.de

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