Master project: 3D-printed magnetocaloric materials for efficient cooling and heating without refrigerants

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Introduction: At Magneto, we believe that we don't have to sacrifice our planet for our comfort or vice versa. Traditional heating and cooling methods are major contributors to greenhouse gas emissions. Our technology provides a sustainable alternative for cooling and heating appliances, as well as waste heat to power conversion. With zero greenhouse gas emissions, no toxic refrigerants, up to 30% higher energy efficiency, and lower ownership costs, we're shaping a greener and more efficient tomorrow. Using cutting-edge additive manufacturing technology, we produce 3D printed materials for magnetocaloric heat pumps, which will revolutionize the cooling and heating industry. Website: https://magneto.systems

Goal: The goal of the proposed research is to explore state-of-the-art chemical compositions, additive manufacturing technologies and post-processing steps to fabricate highly efficient and mechanically stable 3D printed magnetocaloric materials based on MnFePSi. The research aims at improving the mechanical stability of 3D-printed blocks by optimizing the material compositions and processing steps like heat treatment. The focus will be to investigate different chemical compositions and the impact of different heat treatment procedures on microstructure, magnetocaloric properties as well as mechanical strength of the magnetocaloric material and 3D printed block.

Magnetocaloric material (left) and additive manufacturing of magnetocaloric materials (right)

Tasks:

1. Optimization of the material compositions and heat treatment process parameters and its effect on mechanical and magnetocaloric properties
2. Development new compositions and temperature-time profiles of the heat treatment for 3D printed magnetocaloric materials
3. Characterization of magnetic and thermal properties as well mechanical strength, microstructure and grain size of 3D printed magnetocaloric materials.

Your profile: We are searching for a creative, curious and responsible Student from the MSc Applied Science, Materials Science & Engineering or related fields (Mechanical engineering, Manufacturing engineering, chemical engineering).
Knowledge in material characterization, manufacturing technologies, post-processing and heat treatments. Able to perform deep-dive into literature research and filter the relevant parameters.

Sounds like a great opportunity? Get in touch with us!