

Bachelor-/Masterarbeit, HiWi

High-performance geopolymer foam with MPCM for enhanced thermal energy storage insulation

Increasing the energy efficiency of buildings is only possible through the development of new eco-friendly and safe insulation materials. **Geopolymers** have become popular in recent years as an advanced eco-friendly alternative to cement-based materials. Not only can geopolymers reduce CO₂ emissions by more than 40%, compared to traditional cement, but also present outstanding chemical and fire resistance. **Microencapsulated phase change materials (MPCM)** will be for the first time incorporated into geopolymer-based insulation materials to store thermal energy and keep the building at a comfortable temperature during day and night, summer and winter.

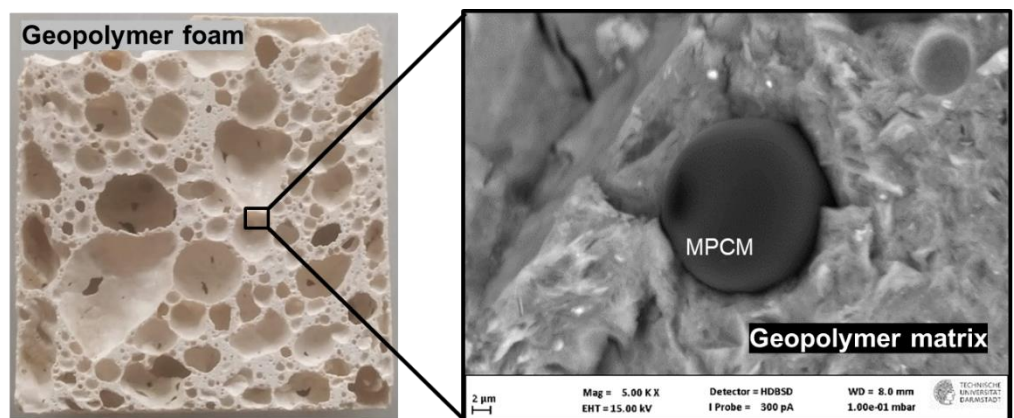
This project aims to develop a multifunctional internal **insulation material** enhanced with MPCM, based on porous geopolymer foam. This insulation material not only has automatic moisture regulation and effective fire protection, but also an adapted thermal conductivity with a high latent heat storage capacity. With the new product, an insulation material will be available for the first time, with which the classic problems of typical interior insulation systems can be solved.

For this, the following tasks and methodology are envisioned:

- Literature review on MPCM-Geopolymer composite materials
- Experimental study of microstructural and mechanical properties of MPCM-Geopolymer pastes and foams.
- Analysis and discussion of results.

Methodology:

- Differential scanning calorimetry (DSC)
- Mechanical tests
- Heatflowmeter (HFM)
- MIP, TGA, FTIR
- SEM, DVS, XRD
- rheology



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The **scope of the project** can be adapted to the thesis accordingly. The exact task can be flexibly adapted according to the student's wishes.