

**PROCESSING AND CHARACTERIZATION OF THERMOPLASTIC
POLYURETHANE (TPU) FOAM AND TPU-COMPOSITE FOAM**
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Keywords: Thermoplastic polyurethane, Micro/Nanocellular foam, Supercritical CO₂, Modelling

ABSTRACT

Foaming of polymers reduces use of bulk material, while obtaining a high strength to weight ratio, low thermal conductivity, good impact resistance and damping properties. Therefore polymer foams have a wide range of application areas such as automotive, textile, packing industry and construction.

In this project thermoplastic polyurethane (TPU) foam and TPU/nanoparticle composite foam were investigated. The foamed samples were made with a two-step temperature induced foaming process, where the samples were first saturated with CO₂/ScCO₂ before the foaming was initiated in a hot oil bath. The composite foam samples were made by adding nanoparticles as nucleation agents in order to get a nanocellular structure. The cell size and cellular morphology were visually investigated by light optical microscope and scanning electron microscope, whilst modelling of the system was carried out, in order to predict the cellular microstructure of the foams.

Additionally, the solubility and diffusion of CO₂ in the TPU was investigated, and thermal and mechanical properties of all samples were determined by TGA, DSC, DMA and tensile testing.

Acknowledgement

The authors of this work gratefully acknowledge Grundfos for sponsoring the 8th MechMan symposium.