# Multiscale characterisation and simulation of open cell metal foams

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The complex microstructure of open cell metal foams results in beneficial global material properties, like a good weight to force ratio, which make this special group of cellular materials interesting for several applications. Open cell metal foams are suitable for lightweight applications as well as for energy management systems.

The dependency of the entire samples mechanical behaviour on its microstructure induces the demand of experiments and simulations on different scales. Therefore, the characterisation is split into three different parts, which concern the micro-, meso- and the macroscale. All levels deal with different structures of the foam. The microscale deals with individual struts, the mesoscale with individual pores and the macroscale treats the whole sample. Hence, a couple of experiments are necessary to specify the material properties of open cell aluminium foams. On the macroscopic level several tests with different load cases, such as pure torsion, pure tension or compression and the superposition of these loading conditions, are needed to obtain the yield surface for the different types of foams. The material parameters on the microscopic level can be identified by micro tensile tests and inverse calculations using a 3D model of the strut. The deviation of the simulation results and the experimental data is minimised by an optimisation. Thus, the used material parameters in the simulations are changed, until the numerical results match the experiments.

In this contribution the focus is the characterisation of open cell metal foams on different hierarchical levels.