# Thermal Diffusivity and Thermal Conductivity of Light Metal Foam Materials

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Metal foam materials represent a specific class of materials mainly used for non structural applications as energy absorption and damping of crash impact. The knowledge of their thermo mechanical properties is essential. Here a method to measure thermal diffusivity of metal foam materials based on a laser flash experiment is described. Any open porosity near the top and bottom surface of the specimen is filled with a ceramic paste whose thermal conductivity is significantly lower than those of the metal matrix. The dried paste and the metal foam structure are grinded to prepare a non-transparent specimen for the laser beam and a plane-parallel detection area for the IR detector. The different runtime of a heat pulse in the metal structure and in the filled pores is used to identify the transient temperature at the rear side of the specimen - necessary to calculate the thermal diffusivity of the foam structure. To quantify the distortion of the specimen properties by the ceramic paste a finite element model was developed. The influences of geometry details of the sample - as diameter and height versus the scaling length of the porosity - could be quantified. Thus in dependence of the measuring problem feasible sample geometry can be defined. As well the self consistency of the numerical results as the agreement of the flash based results with those obtained from a guarded hot plate device has been proofed. As a result for future characterisation of metal foam materials flash devices can be used. The uncertainty of diffusivity results could be estimated less than 7 %. In addition with DSC and dilatometry both cost efficient and sufficiently accurate methods facilitate a basic characterisation of thermophysical properties including the thermal conductivity of metal foam materials.