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ABSTRACT:

Coating-graded Hybrid Foams – Coating Thickness Measurement by Remanent Magnetic Field Scanning

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Cellular materials are structured materials where the mechanical properties are not only determined by the base material, but also by the specific cellular structure. They range from conventional stochastic foams to complex pre-designed and architected structures that can only be produced by additive manufacturing. The present study deals with an overview of current trends on various types of cellular materials, followed by the manufacturing and characterisation of hybrid materials such as nickel/polyurethane (Ni/PU) hybrid foams. These were produced by electrochemical coating of lightweight structures leading to new materials, which can be used as crash absorbers, but also for lightweight design applications. Optimising the coating quality of the developed hybrid materials necessitates a characterisation on different scales regarding the coating thickness distribution. The ferromagnetic properties of the nickel coating enable a remanent magnetisation of the produced hybrid foams and a subsequent measurement of resulting remanent fields. Previous studies [1] have shown, that the local strength of these fields correlate with the deposited mass thus the coating thickness. The developed automated measurement of this study gives useful information about the homogeneity and the local coating thickness distribution according to an appropriate calibration. In order to optimise the coating quality of the newly developed hybrid materials, improved deposition conditions as well as semi-automated characterisation methods are studied to establish a largescale industrial production and a higher applicability of hybrid materials in the near future.

[1] A. Jung, M.R. Koblischka, E. Lach, S. Diebels, H. Natter, Int. J. Mater. Sci. 2 (4) 97–107 (2012)