Study of the magnetic flux density distribution of nickel coated aluminium foams

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Abstract

Open cell aluminium foams are metal cellular structures with a large volume fraction of pores. Due to their high stiffness to weight ratio, they are commonly used in applications for energy absorption and mechanical damping. The stiffness of the aluminium foam was increased by a nanocrystalline nickel coating via an electrodeposition process. The deposition process and thus the coating thickness strongly depend on mass transport limitations. To visualize the coating thickness distribution of the foam, we measured the magnetic flux density distribution by scanning the surface of cuts of coated foams with a commercial Hall probe. By measuring the magnetic flux density distribution, deposition parameter as the current density and flow conditions could be optimized with regard to a more homogeneous coating thickness distribution. Furthermore a model of the mass transport limitation at a complex three dimensional foam electrode could be evaluated from the magnetic flux density distribution of the nickel coated foam cuts.