Formation of Hard Magnetic Phase in Bulk $Al_{45}Mn_{55}$ Prepared by Suction Casting

Leonardo Viana Dias[1, a)], Peter Švec[1, 2], Irena Janotová[1 ,2], Dušan Janičkovič [1] and Peter Švec Sr.[1]

[1]*Institute of Physics, Slovak Academy of Sciences, Dúbravská cesta 9, 845 11 Bratislava, Slovakia*
[2]*Centre of Excellence for Advanced Materials Application, Slovak Academy of Sciences, Dúbravská cesta 9, 84511 Bratislava, Slovakia*

[a)] Corresponding author: leonardo.dias@savba.sk

Abstract. Metastable tetragonal τ-phase with L10 structure and composition $Al_{45}Mn_{55}$, which can be formed in Al-Mn alloys with composition 50 – 60 at. % Mn, is strongly ferromagnetic and has potential to replace conventional hard magnetic materials using strategic rare-earth elements. Its preparation by rapid quenching of a suitable alloy precursor and subsequent thermal processing of prepared ribbons has been successfully assessed in our previous works. The aim of this contribution is preparation of the alloy in bulk form from $Al_{45}Mn_{55}$ precursor by suction casting. Special construction of suction casting attachment to commercial arc-melting furnace has allowed to prepare alloy rods with 3 mm diameter and length of more than 5 cm. Structure and phase analysis of such bulk-quenched rods in as-prepared and annealed states will be presented to monitor the evolution and content of the τ-phase and its selected properties using differential scanning calorimetry, magnetic thermogravimetry, x-ray analysis and electron microscopy.

Support of the projects APVV-19-0369, VEGA 2/0144/21, M-ERA.NET COSMAG and stimuli HEES4T is gratefully acknowledged.