Effect of Co Addition on Glass Forming Ability of $Gd_{5.09}Ge_{2,03}Si_{1,88}$ Magnetocaloric Alloy

M. A. B. Mendes[1,*,#], B. D. Gonçalves[1], W. Imamura[2], C. S. Alves[2], A. B. Gagliotti[1]

[1]Department of Materials Engineering, Federal University of Technology of Parana, Londrina 86020-430, Brazil.
[2]Mechanical Engineering Post Graduation Program, State University of Maringá, Maringá 87020-900, Brazil.
[#]Corresponding author: marciomendes@utfpr.edu.br

Due to its superior efficiency and environmental friendliness, the magnetic refrigeration is a promising alternative to conventional gas compression technology. It is based on the magnetocaloric effect (MCE), which is a material's ability of cooling when removed from an external magnetic field in an adiabatic process. Therefore, the search for a room temperature magnetic refrigerant is of special interest. In the present work, ingots of $Gd_{5.09}Ge_{2.03}Si_{1.88}$ composition were prepared by arc-melting. One of the ingots was melted with the addition of approximately 1% in mass of cobalt to improve both the glass-forming ability and magnetic properties of the sample. The ingots were remelted and quickly cooled in a wedge copper mold to obtain different solidification cooling rates. The samples were characterized by differential scanning calorimetry (DSC), X-ray diffraction (XRD) and scanning electron microscopy (SEM). The samples also were etched with 2% Nital and analyzed by an optical microscope. The magnetic measurements were carried out using a magnetometer and the MCE was determined from the isothermal magnetization versus field curves (MxH). This work produced some promising samples and have shown that this processing route allows the manufacturing of materials with a metastable structure and which show the magnetocaloric effect.