Posters Sessions

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The magneto-structural transformation materials, which experience the crystallographic and magnetic phase transition simultaneously, have attracted considerable attention not only for their importance in fundamental physics but also for their promising applications as multifunctional materials. Magnetic refrigeration based on the magnetoacoustic effect (MCE) is a possible alternative to the current vapor compression technology [1]. Nowadays, most studies on magnetic refrigerants are focused on materials undergoing a first order phase transition because of their potential applications at room temperature.

The CoMnGe$_{2+2x}$Ga$_{1-2x}$ compound was prepared by arc melting by using high-purity elements. Synchrotron experiments were performed in the temperature range between 290 and 390 K on B2 in HASYLAB/DESY in Hamburg. A synchrotron X-ray wavelength of 0.688105 Å was used. Magnetic measurements were performed as functions of temperature and magnetic fields with Physical Properties Measurements System-PPMS between 5 and 350 K under magnetic field up to 7 Tesla.

Synchrotron experiments show that this compound exhibits the structural transition from high temperature phase (orthorhombic-space group: Pmmn) to low temperature phase (cubic-space group: P6$_3$/mmc) around the room temperature. According to Rietveld refinement, the unit cell volume of the high temperature phase is 77.3 Å$^3$ and the unit cell volume of low temperature phase is 160.9 Å$^3$ at 300 K.

According to temperature dependence of magnetization measurements, this compound has thermal hysteresis between FC and FH curves and this thermal hysteresis confirms the structural transition around $T_N$. While on FC mode the Curie temperature is 308 K, the Curie temperature is 319 K on FH mode. According to M(H) curves, this compound exhibit magnetic field induced structural transition. This magneto-structural transition makes this material very important for magnetic cooling technology. The magnetoacoustic effect of this compound is estimated by using Maxwell equation. The magnetic entropy change is 4.5 J/kg.K and 30.9 J/kg.K for the magnetic field change of 1 Tesla and 7 Tesla, respectively.

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Magnetic structures of the family $R_{3}M_{5}In_{3n+2}$ of intermetallic compounds

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The family $R_{3}M_{5}In_{3n+2}$ (R = Ce - Tb; M = Rh, Ir or Co; m = 1; n = 0, 1) has been intensively investigated because of its close relationship with the interesting physical properties found in other compounds of this family, specially for the $R = $ Ce compounds, for whose a heavy fermion behavior with unconventional superconductivity (USC) has been reported [1,2].

In this work we present a systematic study of the physical properties and the determination of magnetic structures of a new series of isostructural compounds $R_{3}M_{5}In_{3n+2}$ (R = Gd, Tb, Sm; M = Rh, Ir; m = 1, 2; n = 0, 1) exploring their relationship with physical properties of Ce-based compounds from this family. The magnetic structures of tetragonal Gd$_3$IrIn$_5$, GdRhIn$_5$, TbRhIn$_5$, TbRhIn$_6$, Sm$_3$IrIn$_5$, and cubic GdIn$_5$ compounds have been determined using x-ray magnetic scattering (XMRMS) at the bending magnet XRD2 beamline of the Laboratório Nacional de Luz Sincrotron (LNLS), in Campinas, Brazil. All these systems order antiferromagnetically in commensurate structures below their Néel temperatures ($T_N$) with propagation vectors (1/2,0,0), (0,1/2,1/2), (1/2,1/2,1/2), (1/2,0,0) and (1/2,1/2,0), respectively [3-6]. The comparison between all the determined magnetic structures will be performed in terms of crystal field (CEF) effects along the series. The magnetic moments of rare earth ions are oriented in the tetragonal $ab$-plane for $R = $ Gd and Sm, IrIn$_5$ compounds, while for the Tb-based systems order along the $c$-axis direction. $T_N$ is increased along the tetragonal Tb-based compounds (Tb1-1-5 and Tb2-1-8) when compared to the cubic TbIn$_5$, compound ($T_N = 32 $ K), as has been found for Nd-based compounds from this family [7].