Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Crystal structure and ferromagnetism of the new $Gd_3(Co_xNi_{1-x})_2$ compounds ALESSIA PROVINO, PIETRO MANFRINETTI, Ames Laboratory, USA, MARINA PUTTI, University of Genova, Italy, DURGA PAUDYAL, KARL A. GSCHNEIDNER JR., Ames Laboratory, USA — The rare-earth binary compound "Gd_3Ni_2," reported in current literature with an uncertain composition and unknown crystal structure, has been synthesized. We have found it to be a high temperature and stoichiometric phase; it exists in the range between 660-695 °C and can be retained at room temperature, as a metastable phase, by mild quenching. Its crystal structure has been studied: it crystallizes in the monoclinic Dy_3Ni_2 structure type [$mC20$, space group $C2/m$, Z=4, the lattice parameters are a =13.418(3) Å, b =3.720(1) Å, c =9.640(2) Å, β =106.250(3) °]. It has also been found that Ni can be replaced by substituting Co: up to x $\approx$ 1 without change of the crystal structure . Moreover, such substitution appears to stabilize these new phases down to room temperature. The physical properties of all these phases have been investigated. Gd_3Ni_2 shows a ferromagnetic behavior with T_C =150 K; the transition temperature increases with the Co content. The magnetocaloric properties have also been studied by magnetization and heat capacity measurements. Theoretical calculations have been performed to explain the phase stability, formation, and the ferromagnetic behavior of these compounds.

Alessia Provino
Ames Laboratory, Ames, IA, USA

Date submitted: 15 Nov 2013 Electronic form version 1.4