MAGNETIC PROPERTIES AND ELECTRONIC STRUCTURES OF Gd$_3$Cu$_4$X$_4$ (X = Ge, Sn)

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Polycrystalline samples of Gd$_3$Cu$_4$X$_4$ (X = Ge, Sn) were investigated by means of magnetometry and XPS. Additionally, calculations of the electronic structures with the TB-LMTO method were performed for both compounds. They were found to be antiferromagnets; the stannide - below 13 K and the germanide - below 11 K. The electronic structures determined from the photoemission spectra agree well with the results of the calculations. Analysis of the core levels indicates presence of the Cu$^{+1}$ ions in both compounds. Besides, charge transfers from the Cu and Ge atoms, the latter only in Gd$_3$Cu$_4$Ge$_4$, were detected.

Subject category:
4. Rare Earths and Actinides, Alloys and Compounds

Presentation mode:
poster

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