Electronic structure of RCo_xGe_2 ($R = Ce$, Pr, Gd) compounds

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Electronic structure of $CeCo_{0.89}Ge_2$, $PrCo_{0.85}Ge_2$ and $GdCo_{0.64}Ge_2$ which crystallize in the orthorhombic $CeNiSi_2$-type structure was studied by X-ray photoemission spectroscopy.

The valence bands of $CeCo_{0.89}Ge_2$ and $PrCo_{0.85}Ge_2$ have similar character. The two maxima at 0.9 and 2.0 eV for the Ce-compound and at 0.9 and 3.0 eV for the Pr-compound are observed. In the case of $GdCo_{0.64}Ge_2$, the strong intensity peak at 8.7 eV corresponding to Gd $4f$ states except the broad peak with the maximum at 1.4 eV was found. The analysis of the XPS spectra of Ce and Nd $3d_{5/2}$ and $3d_{3/2}$ in the Gunnarson-Schönhammer model [1] give the information on the hybridization of the f orbital with the conduction band. The separation of the peaks based on the Doniach-Šunjić theory [2] gives the ratio: $r = I(f^{n+1})/[I(f^n) + I(f^{n+1})]$. The r values are equal 0.12 for $CeCo_{0.89}Ge_2$ and 0.22 for $PrCo_{0.85}Ge_2$ which correspond to the hybridization energy 58.1 eV and 106.6 eV respectively. These values indicate stability of the f shell in these compounds.

[1] O. Gunnarson, K. Schönhammer, Phys. Rev. B, **28** (1983) 4315.

[2] S. Doniach, M. Šunjić, J. Phys. C, **3** (1970) 285.

9.7 cm

13.4 cm

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