Crystal structure and physical properties of the $CeFe_{1-x}Cr_xGe_3$ and $CeFe_{1-x}V_xGe_3$ systems

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Ternary Ce-based germanides with the composition $CeTGe_3$ (T – 3d element) crystallize in structures, which can be different for various T substitutions. For example, the $CeFeGe_3$ compound is a well-known paramagnet with a large Kondo temperature (around 150 K) and a tetragonal noncentrosymmetric $BaNiSn_3$–type structure. On the other hand, $CeCrGe_3$ and $CeVGe_3$ crystallize in the hexagonal $P6_3/mmc$ $BaNiO_3$–type structure, where the former compound is a ferromagnet with $T_C = 73$ K and a Kondo behaviour and the latter one is an antiferromagnet with $T_N = 6$ K. As the physical properties of these compounds can be easy modified by the change of the chemical composition, we focused our attention on the $CeFe_{1-x}Cr_xGe_3$ and $CeFe_{1-x}V_xGe_3$ series. In this work we have shown by means of X-ray diffraction (XRD), magnetic susceptibility and heat capacity measurements that a small doping of the 3d element can keep the crystal structure but changes strongly the magnetic and thermodynamic properties. However, it is found that a large doping deteriorates the starting structure.