

Ground-State Anisotropy and Crystal Electric Field Splitting in Ce-Based Ternary Intermetallics

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Cerium-based intermetallic compounds have been extensively investigated due to their rich and unconventional physical properties. The proximity of the $4f$ level to the Fermi energy plays a central role in generating these phenomena. In rare-earth systems, the crystal electric field (CEF) strongly influences the anisotropic physical properties by lifting the degeneracy of the trivalent-ion multiplets. The J -multiplet of Ce^{3+} , initially split by strong spin-orbit coupling, undergoes further splitting under the CEF produced by the surrounding point-charge environment. Depending on the site symmetry, the CEF can yield doublet or singlet ground states. For instance, the $J = 5/2$ ground-state multiplet of Ce^{3+} splits into a doublet and a quartet in cubic symmetry, whereas it splits into three Kramers doublets in tetragonal symmetry. In this work, we present a comprehensive study of the anisotropic physical properties of selected Ce-based ternary intermetallic compounds that exhibit intriguing ground-state behavior arising from CEF effects. Detailed results on the influence of the CEF on the anisotropic magnetization of CeAg_2Ge_2 , CeAgSb_2 , CeRh_6Ge_4 , and CeRu_2Ge_2 single crystals will be discussed.