

Revised Measurements and Interpretation of Magnetic Properties of Oriented CeF₃ Single Crystals

Savinkov A., Korableva S., Tagirov M., Suzuki H., Matsumoto K., Abe S.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 Springer Science+Business Media New York We report the magnetic susceptibility and magnetization of the single-crystal CeF₃ (Formula presented.) precisely measured in external magnetic field-directed B_{\parallel} (Formula presented.) and B_{\perp} (Formula presented.) in wide ranges of temperatures from 1.8 to 300 K and magnetic field strength of 0–40 kG. Magnetic susceptibility, magnetization, and Ce³⁺ (Formula presented.) Stark energies of CeF₃ (Formula presented.) have been calculated in the framework of the crystal field theory; good agreement with the experimental data has been achieved in the whole range of temperatures and magnetic fields without taking into account the mixed-valent Ce³⁺ (Formula presented.)-Ce⁴⁺ (Formula presented.) behavior or super-exchange interaction of cerium ions that have been proposed before. Anomalous behavior of the magnetic susceptibility near $T \approx 50$ K is naturally explained in the crystal field model.

<http://dx.doi.org/10.1007/s10909-016-1639-0>

Keywords

CeF₃, Crystal field, Magnetic susceptibility