Mössbauer Investigation of Eu^{3+} Site Occupancy and Eu-O Covalency in Y_2O_3 and Gd_2O_3 Nanocrystals

G. Concas, C. Muntoni, G. Spano, M. Bettinelli[a], and A. Speghini[a]

Dipartimento di Fisica, Università di Cagliari and Istituto Nazionale per la Fisica della Materia, S.P. Monserrato-Sestu km 0.700, I-09042 Monserrato (Cagliari), Italy

[a] Dipartimento Scientifico e Tecnologico, Università di Verona, Ca' Vignal, Strada le Grazie, I-37134 Verona, Italy

Reprint requests to Dr. G. C.; Fax: +39 070 510171; E-mail: giorgio.concas@dsf.unica.it

Z. Naturforsch. **56 a,** 267–272 (2001); received November 11, 2000

Samples of nanocrystalline $Y_{1.8}Eu_{0.2}O_3$ and $Gd_{1.8}Eu_{0.2}O_3$ were examined by ^{151}Eu Mössbauer spectroscopy. The degree of covalency of the Eu-O bond has been studied. The spectrum of the cubic $Y_{1.8}Eu_{0.2}O_3$ sample has been resolved into 2 contributions due to europium in the C_{3i} and C_2 sites, for the first time in ^{151}Eu Mössbauer spectroscopy. The degree of covalency and the electric field gradient of the 2 sites has been compared. The occupancy, by the lanthanide ion, of the more and less symmetric sites in the cubic structure of $Y_{1.8}Eu_{0.2}O_3$ has been investigated and discussed.

Key words: Europium; Yttrium; Oxides; Nanocrystals; ^{151}Eu Mössbauer Spectroscopy.