GIANT MAGNETOOPTICS OF BISMUTH-SUBSTITUTED IRON GARNETS: A THEORETICAL ANALYSIS

A.V. Zenkov and A.S. Moskvin
Dept. of Theoretical Physics
Ural State A.M. Gorky University
Lenin Ave., 51, 620083 Ekaterinburg, Russia

In the framework of the charge-transfer transitions concept, we suggest a semi-quantitative model which explains the strong increase of the circular magnetooptics of iron garnets $R_3Fe_5O_{12}$ when doped with Bi^{3+} or Pb^{2+} ions. The covalent admixture of Bi^{3+}, Pb^{2+} $6p$-orbitals (with giant one-electron spin-orbit coupling constant) to oxygen $2p$-states causes the growth of the oxygen contribution to the spin-orbit coupling constant of $(FeO_6)^{9-}$, $(FeO_4)^{5-}$ complexes (main magnetooptically active centers of iron garnets). The enhanced spin-orbit interaction on the oxygen is not the only effect of substitution; it also gives rise to the effective anisotropic tensor addend to the spin-orbit interaction and the circular magnetooptics of iron garnets as well. Estimates of various contributions to the iron garnets magnetooptics are given. The computer simulation of magnetooptic spectra of $Y_{3-x}Bi_xFe_5O_{12}$ under the inhomogeneous bismuth distribution is made. Analysis of experimental data on garnets magnetooptics speaks in favor of our theoretical model.

9.7 cm

13.4 cm

Subject category :

3. Transition Metals, Alloys and Compounds

Presentation mode :
poster

Corresponding author :
A.V. Zenkov

Address for correspondence :
Kuibyshev St., 88-43, Ekaterinburg 620100, RUSSIA

Email address :
andreas@r66.ru