

OPTICAL PROPERTIES OF RARE EARTH DOUBLE TUNGSTATES: EXPERIMENT AND THEORY

M.T.Borowiec¹, T.Zayarnyuk^{*1}, E.E.Zubov², M.Barański¹,
H.Szymczak¹.

¹Institute of Physics, PAS Al. Lotników 32/46 Warsaw, Poland

²A. A. Galkin Donetsk Physic-Technical Institute, Donetsk, Ukraine

*e-mail: zayar@ifpan.edu.pl

The rare earth double tungstates $KRe(WO_4)_2$ ($Re = Er^{3+}, Ho^{3+}$) single crystals were prepared with using TSSG technique (sometimes so called the modified Czochralski method) [1]. The absorption spectra have been measured in the spectral region $11000-25000\text{cm}^{-1}$ at temperature 3.8K [2].

The Hamiltonian of erbium and holmium ions in low-symmetric crystal fields is constructed with fifteen crystal field parameters.

The crystal field parameters consider the contribution of the electrostatic field by the point charges of the ions and the contribution of the exchange charge field [3]. The shielding factor and the overlap integrals were considered in calculation of the crystal field parameters. The overlap integrals are between the wave functions of the 4f electron of the RE ions and the 2s, 2p electrons of the ligands. Theoretical and experimental results have been compared.

This work was supported in part by the EU project DT-CRYS and by Polish State Committee on Science (KBN) (decision of project No. 72/E-67/SPB/6. PR/DIE 430/2004-2006).

- [1] Majchrowski A., Borowiec M.T., Michalski E., *J. of Crystal Growth*, **264**, 201 (2004).
- [2] M.T.Borowiec, A.Watterich, T.Zayarnyuk, V.P.Dyakonov, A.Majchrowski, J.Zmija, M.Baranski, H.Szymczak, *J. Applied Spectroscopy*, **71**, 810 (2004).
- [3] B.Z.Malkin, in A.A.Kaplyanskii, R.M.Macfarlane(Eds), *Spectroscopy of Solid Containing Rare-earth Ions*, Elsevier, Amsterdam, 1987, chapt.2, p.13