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Broad band excitation of RE^{3+} ions doped into tellurite and antimonite glasses

P. Kostka[1], J. Zavadil[1], P. Gladkov[2] & R. Yatskiv[2]

[1]*Laboratory of Inorganic Materials, joint workplace of the University of Chemistry and Technology Prague and the Institute of Rock Structure and Mechanics of the Czech Academy of Sciences, V Holešovičkách 41, 182 09 Prague 8, Czech Republic*
[2] *Institute of Photonics and Electronics CAS, Chaberská 57, 182 51 Praha 8, Czech Republic*

Corresponding author: petr.kostka@irsm.cas.cz

Ternary TeO_2-ZnO-TiO_2 glasses doped with thulium (Tm) and antimonite glasses Sb_2O_3–PbO–ZnO/ZnS doped with $ErCl_3$ were prepared by using melt quenching method and investigated by means of transmission, and room and low-temperature photoluminescence (PL) spectroscopy. For PL excitation we used 514.5 and/or 532 nm lines, i.e. the wavelengths capable to excite the electronic structure of both studied host glass systems but not in resonance with 4*f* levels of Tm^{3+} ions. We were able to observe simultaneously the broad-band luminescence of the host glass and the narrow features due to 4*f*–4*f* transitions in RE^{3+} ions. Special attention was given to the wavelengths range where the broad-band luminescence of the host glass overlaps with 4*f*–4*f* transitions within RE^{3+} ions.

For tellurite system we report the observation of a broad host-glass-emission band centred at about 850 nm and of a narrow emission bands and/or absorption dips, due to 4*f*-4*f* transitions in Tm^{3+} ions, superposed on the broad-band PL. In Er doped antimonite glasses a broad PL band centred at about 1050 nm was observed together with the superimposed narrow emission band at 985 nm and a narrow absorption dip at about 970 nm. We assign the observed narrow absorption dips in the broad-band host-glass luminescence to the electronic up-transitions in Tm^{3+} and/or Er^{3+} dopants. These observations provide the evidence for the energy transfer between the electronic structure of the host-glass and 4*f* states of RE^{3+} ions.

In addition, in both studied systems we observed that the intensity of the broad luminescence band, due to electronic transitions in the host, decreases with increasing concentrations of doped-in RE^{3+} ions. This observation further supports our conclusion that the energy transfer between the electronic structure of the host glass and 4*f* states of doped-in RE^{3+} ions is behind the reported narrow absorption dips.