COOPERATIVE DOWN-CONVERSION MECHANISM IN Te^{4+}/Yb^{3+} CO-DOPED TeO_2-Li_2O GLASS

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<u>Introduction</u>: Tellurite glasses are of scientific and technological interest due to their low melting temperatures, good optical transmission in the visible and infrared regions, high refractive index, low phonon energy etc. During the glass synthesis, it can be expected that the TeO_2 participate both as a network conditional former and also in the ionic form (Te^{4+}) into the glass [1]. Tellurite glasses doped and co-doped with rare earths have been extensively studied to improve the conversion efficiency of Si solar cells through the down-conversion mechanism (DC). **<u>Aim</u>:** The work has as objective monitoring the luminescent characteristics of Te^{4+} ion present in glassy system 80Te-20Li when adding Yb^{3+} ion in a glass host. **<u>Material and methods</u>:** The glass host 80Te-20Li single doped with 0.5; 1.0; 2.0; and 4.0 mol % of Yb^{3+} ions were synthesized for characterization. Emission spectra were obtained at various excitation wavelengths using as source a Xe (150 W) lamp. By solving the rate equations system was possible to determine the energy transfer efficiency of the process (η_{ET}), considering the heat generated in the sample after pump it with a laser (thermal lens effect). **<u>Results and discussion</u>:** Fig. 1 show the luminescence of the Te^{4+} (a) for maximum excitation between 330 and 400 nm, and the luminescence of the Yb^{3+} ion (b) in the sample 2.0 %mol, when excited in the region where Te^{4+} ion absorbs. The visualization of the Yb^{3+} emission under excitation in the (UV-Vis) region indicates that Te^{4+} is responsible for the absorption of UV radiation and subsequent transfer to the Yb^{3+} ion. The values of η_{ET} determined by rate equations using values determined by lifetime and thermal lens measurements are plotted in Figure 1 (c) as function of the Yb^{3+} concentration. It is observed a good agreement among the used procedure, showing an increase in η_{ET} when it is raised the Yb^{3+} ions concentration in the glassy host. **<u>Conclusions</u>:** The results show that the Yb^{3+} ion-doped 80Te-20Li glass system exhibits a mechanism of energy transfer between the Te^{4+} ions present in the tellurium glass and the dopant ions and the values obtained by both techniques present good agreement to one another and demonstrating that it is possible to determine the efficiency of the energy transfer process by measuring the heat generated in the sample.

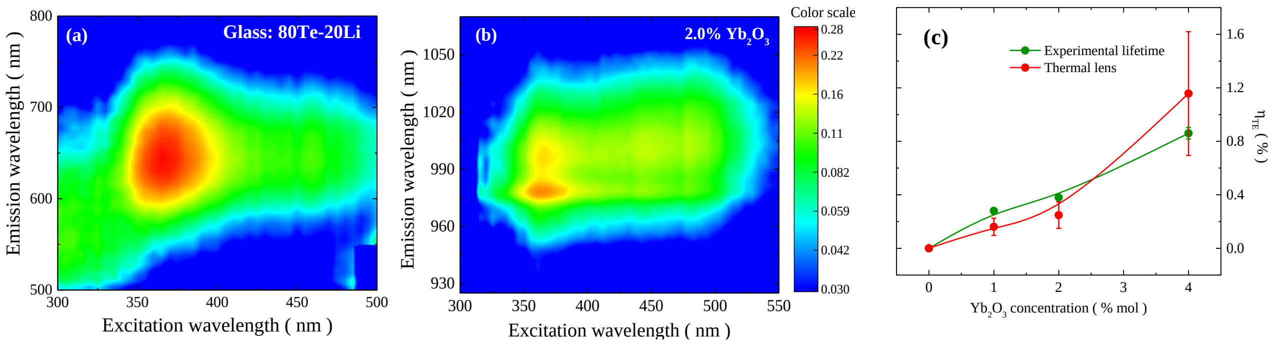

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Figure 1. Excitation-emission maps for the $80TeO_2$-$20Li_2O$ glass at room temperature (a) and of the TeLi: 2.0 Yb_2O_3 mol% glasses (b). Values of the energy transfer efficiency as a function of the Yb_2O_3 concentration (c).

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