Spatially resolved luminescence characterisation of rare earth doped chalcogenide glass microspheres

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The fluorescence properties of rare earth doped chalcogenide microspheres (≈ 80 μm in diameter) have been investigated by confocal luminescence experiments. The comparison of the emission spectra obtained in both microspheres and bulk material has been used to elucidate the possible influence that the fabrication procedure could have on the luminescence properties of the rare earth ions.

The main contribution of confocal micro-luminescence is that it provides the possibility of controlling the spatial location of the excitation spot. This is of special relevance in the case of rare earth doped microspheres since the presence of individual Whispering Gallery Modes (WGM) can be probed. We will show that when the excitation beam is focused close to the microsphere edge the fluorescence spectrum is mainly constituted by a series of periodic peaks, which are attributed to the presence of WGM. When the excitation beam is focused in the centre of the micro-sphere the contribution of WGM to the emission spectra disappears and the bulk emission is observed. As an example, we have included in the figure below the emission spectra obtained from a neodymium doped chalcogenide microsphere when the excitation beam is focused at the edge and at the centre of the microsphere. From the analysis of the emission spectra obtained at different radial distances we have been able to estimate the spatial extension of WGM.