SPECTRAL PROPERTIES OF
Er\textsuperscript{3+}-DOPED CHALCOGENIDE GLASSES

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Lanthanum sulphides glasses formed with sufficient proportions of Ga\textsubscript{2}S\textsubscript{3} constitute a very convenient matrix for rare earth sulphides [1,2], and Pr\textsuperscript{3+}-doped Ga\textsubscript{2}S\textsubscript{3}:La\textsubscript{2}S\textsubscript{3} (GLS) glasses have been recognized as one of the most promising candidates for fibre amplifiers operating at a wavelength of 1.3\textmu m [3]. In this report, the spectral properties of chalcogenide glass of the molar composition 0.7Ga\textsubscript{2}S\textsubscript{3}:0.3La\textsubscript{2}S\textsubscript{3} doped with Er\textsuperscript{3+} are presented and discussed. Emission and absorption spectra and lifetimes of energy levels have been measured. The 2.7\textmu m emission, as shown below, has been observed from chalcogenide glass for the first time. Radiative and non-radiative transition rates are calculated and compared with the measured lifetimes of interesting energy levels.

Comparing this glass with Er\textsuperscript{3+}-doped silica glasses, we show that the absorption and emission cross-sections of Er\textsuperscript{3+}:GLS are around 2.5 times higher, radiative transition rates are around five times higher due to its higher refractive index, while multiphonon non-radiative decay rates are around three orders lower due to its much lower phonon energy. Consequently there is a dramatic difference in excited state lifetimes between these two classes of glass. Taking account of the spectral properties of Er\textsuperscript{3+}:GLS, as well as the higher solubility for rare earth ions in GLS [1], we will briefly show the potential applications of this glass via a theoretical model.

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