

# **A portable luminescent thermometer based on green up-conversion emission of $\text{Er}^{3+}/\text{Yb}^{3+}$ co-doped tellurite glass**

Danilo Manzani\*, João Flávio da Silveira Petrucci, Karina Nigoghossian, Arnaldo Alves Cardoso, Sidney J. L. Ribeiro

*Institute of Chemistry, São Paulo State University, UNESP, CP 355, Araraquara, SP, Brazil*

\*e-mail: [danilo.manzani@gmail.com](mailto:danilo.manzani@gmail.com)

The determination of temperature is an essential parameter in several application scenarios, such as in the biomedical, technological and industrial fields. Optical thermometry appears as an excellent alternative for conventional electric-based temperature sensors, featuring advantages such as non-contact methods, fast response, no interference of the electromagnetic field and high temperature sensitivity. In this contribution, we have proposed an optical thermometer probe comprised of an  $\text{Er}^{3+}/\text{Yb}^{3+}$  co-doped tellurite glass attached on the tip of an optical fibre and optically coupled to a laser source and a portable USB-spectrometer. The ratio of the up-conversion green emission integrated peak areas when excited at 980 nm is temperature dependent and employed for thermometer calibrations purposes. The thermometer was operated in the range of 5 – 50°C and 50 – 200°C, revealing excellent linearity ( $r^2 > 0.99$ ), suitable accuracy and precision of  $\pm 0.5$  and  $\pm 1.1$ °C, respectively. The high thermal sensitivity presented by the obtained probe results from the optimization study on  $\text{Er}^{3+}$  concentration to obtain high green emission intensity and thus higher sensitivity. The described probe presented suitable properties for its application as a temperature sensor and superior performance among others  $\text{Er}^{3+}$ -based optical thermometers, in terms of thermal sensitivity.