

## Student Speech Contest 2024

# Study of the development of luminescent bioglass for multimodal diagnostic imaging



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### LANTHANIDE-DOPED BIOGLASS FOR MULTIMODAL DIAGNOSTIC IMAGING



### Visualization of cells under NIR light using bioglass co-doped with Gd/Yb/Er

#### Abstract

Bioglass is a ceramic biomaterial that contains calcium and phosphate as its main materials. It is characterized by having excellent biocompatibility and is of great interest in regenerative medicine and is widely used for scaffolds, bone defect repair, among others. There have been a significant number of studies over the years aimed at analyzing the different compositions and ideal amounts of silica, calcium and phosphate and how they influence the bioactivity of glass [1]. Currently, several studies are investigating the development of biomaterials with photoluminescence properties using lanthanides for pharmaceutical applications, in order to evaluate the effectiveness of the treatment [2]. The literature shows that rare earths such as Gadolinium (Gd), Ytterbium (Yb), Erbium (Er) and Europium (Eu) have up-conversion and

down-conversion luminescence characteristics. This study aims to evaluate the doping of materials using the hydrothermal method and to develop a biomaterial with luminescent potential, thus obtaining optically active biocompatible powders for multimodal imaging diagnostics [3].

**CHARACTERIZATIONS:** The powders obtained were characterized by X-ray powder diffraction (XRPD, Philips PW 1050 diffractometer), Fourier transform infrared spectroscopy (FTIR, Nicolet iS10 FT-IR Spectrometer), photoluminescent measurements (TE-Cooled CCD fluorescence spectrometer, Glacier X, BWTEK, USA) and MTT assay.

**RESULTS AND DISCUSSION:** Analysis of the crystal structure confirmed that a glass-amorphous system was obtained in the undoped sample, while the RE-doped samples have poorly crystallized RE oxides and phosphates. FTIR spectroscopy revealed quaternary glass vibration modes of the desired composition, as well as RE oxide bands. Photoluminescent measurements confirmed the emission capacity: up-conversion emission for the Gd/Yb/Er doped sample and down-conversion emission for the Gd/Eu sample. MTT tests indicate that the samples are not cytotoxic and can be used in medicine.

## References.

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