Fabrication and characterization of single-mode and multi-mode Er-doped phosphate fibers for biomedical applications

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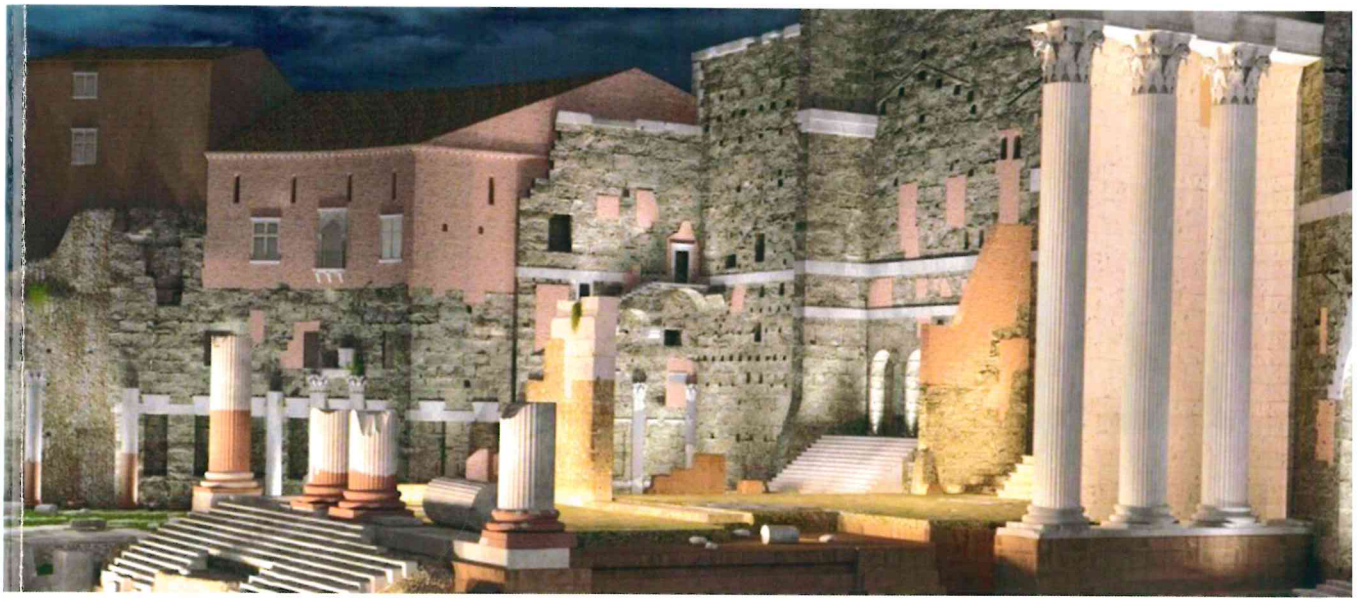

Program and Abstracts

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Fabrication and characterization of single-mode and multi-mode Er-doped phosphate fibers for biomedical applications

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Phosphate glasses are materials of interest for the engineering of photonic devices, due to their easy processing, good thermal stability, excellent optical properties and high rare-earth ions solubility. Besides, phosphate glasses with a P_2O_5 content of 50 mol% have been shown to be bioactive, degradable and suitable for fiber drawing [1]. However, up to now only few studies that combine both biocompatibility and suitable optical properties have been reported [2]–[4]. The goal of our study is to study novel bioactive and biodegradable phosphate glass compositions which could be used to fabricate bioactive fiber sensors and lasers for healthcare applications.

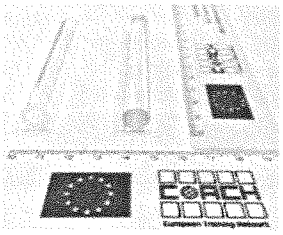

Figure 1 Preforms of the cladding and the core

In this presentation, we will report on the synthesis and characterization of different Er^{3+}-doped bioactive phosphate glasses. The changes in their thermal, structural and luminescence properties with the addition of Al_2O_3, TiO_2 or ZnO are presented. We will show that the addition of ZnO leads to an increase of the intensity of the emission at 1540 nm, which is thought to be related to the Er^{3+} ions solubility. The investigated glasses also possess good thermal stability, making them suitable for the fabrication of fibers. Based on these results, the Zn glass has proved to be a good glass candidate for preform fabrication (see **Figure 1**) and fiber drawing. Single-mode and multi-mode core/cladding optical fibers with inner/outer diameters of around 20/120 μm and 50/125 μm were successfully drawn, respectively.

Figure 2 represents the optical microscope images of the single-mode **(a)** and multi-mode **(b)** fiber cross-sections. We will report on the luminescence studies carried out after selective etching of the cladding of the optical fibers. Preliminary results concerning the changes of the fiber diameter and the spectroscopic properties as a function of immersion time in different solutions will be reported.

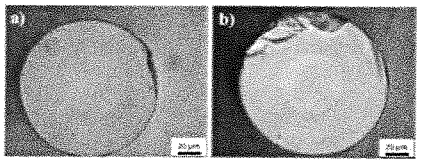

Figure 2 Single-mode (**a**) and multi-mode fibers (**b**)

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