Specialty rare-earth-doped non-silica oxide glasses for compact and coherent light sources

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In recent decades, inorganic rare-earth (RE)-doped glasses have been playing a key role in the development of coherent light sources thanks to their transparency in the visible region, mechanical stiffness and resistance, chemical durability and easy manufacturing into different highly homogenous forms and sizes.

The ultra-low propagation loss and outstanding thermo-mechanical properties have made silica glass the material of choice for most fiber-based optical devices and instruments operating in the near-infrared wavelength region. Despite its success, silica glass exhibits several intrinsic drawbacks, the major one being the poor solubility of RE ions.

In this scenario, multicomponent phosphate and germanate glasses have demonstrated in last years to be true contenders to silica glass as a fiber material, especially for the realization of compact active devices, due to their ability to withstand a very high RE ions doping level. Phosphate glasses are particularly promising for amplifier/laser operation at 1 and 1.5 μm wavelengths, while germanate glasses are commonly exploited in the 2 μm region for surgery, CO_2 sensing and LIDAR systems.

We report on the ongoing activities and the recent results obtained by our research team on the realization of compact lasers and amplifiers using in-house developed RE-doped phosphate and germanate glasses and fibers.

Keywords:

Phosphate glass
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Compact light sources