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## Ytterbium and bismuth clusters impact on silica-based light guides optical and luminescence performances

**Evgeny Savelyev** and **Konstantin M Golant**

Kotel'nikov Institute of Radio-Engineering and Electronics-RAS, Russia

**Y**b<sup>3+</sup> ions in silica are powerhouses for single mode fiber lasers yielding kilowatts CW output powers at a wavelength near one micrometer. Bismuth in silica fibers features with a wide band luminescence (from 1 to 2 microns), which is topical for applications particularly in telecom systems. There is a guide to suppose that small-size, bismuth clusters are mainly responsible for the near-infrared luminescence and lasing in Bi-doped silica. A possibility to increase concentration of active species in the core glass of the lightguide is a very important condition for obtaining effective waveguide or fiber lasers and amplifiers. Nevertheless, such increasing may yield the formation of clusters. The dynamic pattern of clustering depends on mutual solubility of oxides, host glass composition, concentration of an activator and preparation technology of the solid solution. Clustering causes quenching of the metastable state excitation responsible for lasing and adds to the optical waveguide scattering loss. In this communication, we present the results of experimental study of optical loss and luminescence performances of Yb<sup>3+</sup> ions and bismuth in optical waveguides purpose made from fused and unfused silica via the SPCVD technology. Glasses having different contents of Yb, Al, P, Bi, B and Ge additives have been studied. As the result, a relationship between spectral-luminescent properties of the samples, structure and sizes of the clusters in them have been found.

### Biography

Evgeny Savelyev graduated from Lomonosov Moscow State University with a degree in Physics in 2012. He has completed his Post-graduate courses from Kotel'nikov Institute of Radio-Engineering and Electronics of RAS in 2016. The primary subject of his current research is clustering of different activators in silica-based glasses and the influence of the clusters on optical and spectral-luminescent properties of active lightguides. He has talked about the outcomes of his research at various internal and international conferences. He is the co-author of several articles recently published in the *Optical Materials Express* and *Optical Materials*.

swoopermsu@yandex.ru

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