**Nonlinear Optical Properties of Borosilicate Glasses with Silver Nanoparticles for Photonic Applications**

**Krum Shumanov¹, Radostin Stefanov¹, Ekaterina Yordanova¹, Viktoria Atanasova¹, Stefan Karatodorov¹, Nikolay Nedyalkov², Lubomir Aleksandrov3, Georgi Yankov¹**\*

**¹Institute of Solid State Physics, Bulgarian Academy of Sciences (ISSP–BAS), 1784 Sofia, Bulgaria
²Institute of Electronics, Bulgarian Academy of Sciences (IE–BAS), 1784 Sofia, Bulgaria**

**3Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences (IGIC-BAS), 1113 Sofia, Bulgaria \*Corresponding author: gyankov@issp.bas.bg**

**Abstract:**
Borosilicate glass and fused silica are well-established materials in photonic technologies due to their broad optical transparency in the ultraviolet (UV) and near-infrared (NIR) spectral ranges, combined with stable nonlinear optical characteristics. In this study, we investigate the nonlinear optical properties of borosilicate glasses doped with silver nanoparticles using the Z-scan technique and femtosecond laser pulses of 35 fs duration, 408 nJ energy, and 1 kHz repetition rate.

The measured nonlinear refractive index (*n₂*) and multiphoton absorption coefficient (*β*) of the doped glasses were found to be an order of magnitude higher than those of reference fused silica. Furthermore, filamentation in silver-doped borosilicate glass was observed at significantly lower pulse energies, further confirming the higher optical nonlinearity of the medium. These findings highlight the potential of such glasses for nonlinear photonic applications, including optical memory and integrated photonic circuits.

**Acknowledgment:**
This work was supported by the Extreme Light Infrastructure – European Research Infrastructure Consortium (ELI ERIC), under contract DO1-102/26.06.2025.