**Nonlinear Optical Properties of Poly-Lactic Acid (PLA) for Photonic Applications**

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**Abstract**  
We investigate the nonlinear optical properties of poly-lactic acid (PLA), a biodegradable polymer with high transparency in the UV and near-infrared (NIR) spectral regions, using the Z-scan technique under femtosecond laser irradiation (35 fs, 408 nJ, 1 kHz). PLA samples were prepared via compression molding method. Our results show that PLA exhibits a nonlinear refractive index and multiphoton absorption coefficient that exceed those of fused silica by approximately one order of magnitude and are comparable to those of borosilicate glass.

Additionally, filamentation in PLA occurs at significantly lower pulse energies compared to borosilicate and quartz, providing strong evidence for its enhanced nonlinear response. These characteristics, combined with excellent processability and optical clarity, position PLA as a strong candidate for use in photonic structures requiring high nonlinearity, low energy thresholds, and environmentally friendly materials.

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