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Design, synthesis and nonlinear optical characterization of novel mixed ligand ruthenium metal-organic complex

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Abstract

In the present study, novel mixed ligand ruthenium metal-organic complex (RuThAP) was designed and synthesized. The chemical structural analysis was performed using NMR, UV-Vis and FTIR spectroscopy. RuThAP/Poly (methylmethacrylate) (PMMA) films were successfully fabricated by homogeneously embedding RuThAP in optically inactive PMMA using spin-coating. Third-order nonlinear optical coefficients of RuThAP in liquid and solid phase were determined by Z-scan technique with nanosecond laser beam. RuThAP molecule exhibited strong reverse saturable absorptive ($\beta_{\text{eff}} = 8.81 \pm 0.88 \times 10^{-9} \text{ m/W}$) and negative refractive ($n_2 = -5.47 \pm 0.55 \times 10^{-9} \text{ esu}$) optical nonlinearity at 532 nm. The RuThAP molecule also demonstrated strong optical limitation with optical limiting clamping level as low as 38 μJ due to large absorptive optical nonlinearity. These results pave the platform for high efficient metal-organic/PMMA films based solid-state optical limiters with low cost, flexible, dependable and low optical loss.

Keywords:

NLO, Metal-organics, Optical limiting

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