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Two-photon absorption-based optical limiting in 2-(2-methoxybenzyllideneamino)-5-methylphenylmercuric chloride-doped PMMA film

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The synthesis and the linear and optical limiting properties of a 2-(2-methoxybenzyllideneamino)-5-methylphenylmercuric chloride-doped poly(methylmethacrylate) (PMMA) film are described. The sample exhibits strong optical power limiting under continuous wave (cw) laser at the experimental wavelength. The mechanisms for the optical limiting were discussed on the basis of the twophoton absorption involved in the process. The nonlinear absorption coefficient β of the sample is estimated and its value is found to be 67×10^{-2} cm/W. Our study indicated that the investigated compound-doped PMMA film is a potential candidate for optical limiting applications in low power cw regime.

Keywords: Organic materials; nonlinear absorption coefficient; two-photon absorption; optical limiting.

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1. Introduction

Optical limiting (OL) material is a kind of nonlinear optical material that can limit the transmitted light intensity to a maximum value, namely, render transparency to weak signals and opaqueness to strong signals. Such materials can protect sensitive photo-detectors (including optical sensors and human eyes) from undesired high-intensity radiation hazards. Therefore, OL materials have received considerable attentions due to growing needs for optical techniques.[1,2] For an ideal OL material, it should exhibit a high, linear transmission below a certain "limiting" threshold, and above this threshold the transmission becomes highly nonlinear. Thus far, researchers have made great efforts to search for such OL materials.[3–5]