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THz absorption spectrum employed for characterize the mixed Gallium selenide-Tin disulfide saturable absorber and its application for passively Q-switched solid state laser

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Abstract-Due to the ultra-short recovery time and the wider absorption range, graphene-like 2D material have been widely employed as saturable absorbers (SAs) in passively Q-switched and mode-locked lasers. Due to the low photon energy, noninvasive and high resolution, THz wave was widely used to characterize samples. In this paper, the nonlinear saturable absorption property and THz absorption spectrum of Gallium selenide/Tin disulfide ($GaSe/SnS_2$) is reported. Passively Q-switched Nd:GdTaO4 laser with $GaSe/SnS_2$ SA is demonstrated. The maximum output power of 551 mW under the pump power of 5 W.The minimum pulse width is 365 ns at the pulse repetition rate of 89 kHz. Our results indicate that $GaSe/SnS_2$ nanosheets could be used in Q-switched lasers. The $GaSe/SnS_2$ SA with good nonlinear absorption properties and easy fabricating process will promote the ultrafast photonics applications in solid state lasers.

KEYWORDS: Gallium selenide-Tin disulfide; passively Q-switched ; THz absorption spectrum

1. INTRODUCTION

Due to the wider saturable absorption bandwidth, graphene has attracted many researches on the optical properties of graphene-like two-dimensional (2D) materials including, transition metal dichalcogenides (TMDC) or diselenides (TMDS), topological insulators and black phosphorus[1-3]. With good nonlinear properties, graphene-like materials have been widely employed as saturable absorbers (SAs) for