

现代应用光学

基于石墨烯可饱和吸收体的掺铒光纤环形腔脉冲激光器

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摘要：利用新型材料石墨烯作为可饱和吸收体，设计了用于光纤通信和材料加工的环形腔结构脉冲光纤激光器，实验研究了石墨烯可饱和吸收产生脉冲输出的原理以及输出脉冲激光的特性。通过激光诱导沉积法将石墨烯材料转移到光纤端面并将其置于环形激光腔结构中；采用974 nm半导体激光器作为抽运源，掺铒光纤作为增益介质，调节偏振控制器的角度得到了稳定的锁模输出脉冲。获得的锁模脉冲中心波长为1560.1 nm，重复频率为7.89 MHz，脉冲光谱3 dB带宽为0.27 nm，脉冲宽度为14.7 ps。实验显示，由于石墨烯具有良好的可饱和吸收能，损伤阈值比较高，有望取代单壁碳纳米管成为一种新型的激光锁模材料。

关键词：光纤脉冲激光器 石墨烯 环形腔 掺铒光纤 锁模输出

Erbium-doped fiber ring cavity pulsed laser based on graphene saturable absorber

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Abstract: A ring cavity fiber laser was proposed by using graphene as a saturable absorber for fiber optic communication and material processing. The principle how the grapheme could generate pulse trains and the laser output characteristics were studied experimentally. Then the laser induced deposition method was used to transfer the graphene to the fiber end face and place it in the ring laser cavity. By taking a 974 nm semiconductor laser as the pumping source and the Er³⁺-doped fiber as the gain medium, the laser generated stable pulse trains by changing t orientations of a polarizer above the threshold pump power. The experiment shows that the center wavelength of laser is 1560.1 nm with a full width at half maximum spectrum of 0.27 nm and the pulse repetition rate is 7.89 MHz with a pulse width of 14.7 ps. It means that the graphene is expected to replace single-walled carbon nanotubes in pulsed laser applications as a novel mode-locked material because of its good saturable absorption properties and a higher damage threshold.

Keywords: fiber pulse laser graphene ring cavity Er³⁺-doped fiber mode-locked output

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