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## 激光物理与激光器件

### 百皮秒激光脉冲的全光纤放大及应用

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摘要:

为了得到高单脉冲能量的百皮秒激光脉冲,采用自制的被动锁模掺镱光纤激光器获得了100ps的激光脉冲输出,在此基础上采用两级全光纤结构主振荡功率放大器进行功率放大,其中预放大级采用7 $\mu$ m纤芯的双包层掺镱光纤做增益介质,得到平均功率160mW的稳定脉冲输出;主放大级采用20 $\mu$ m纤芯的双包层掺镱光纤做增益介质,在抽运功率逐步增加到35.37W时,输出功率达到了16.60W,相应的单脉冲能量为1.63 $\mu$ J,峰值功率为16.61kW。此外,主放大级输出的激光通过自制的模场转换器与光子晶体光纤(纤芯4.6 $\mu$ m)成功熔接,得到了2.85W的白光超连续光谱,光谱波长覆盖了600nm~1700nm的检测范围。结果表明,此激光可用于超连续谱光源的产生。

关键词: 光纤光学 主振荡功率放大器 高脉冲能量 白光超连续谱

### All-fiber amplification and application of 100ps laser pulse

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Abstract:

In order to get high single pulse energy with 100ps pulse width, a mode-locked Yb-doped picosecond fiber laser was designed and 100ps laser pulse was output. Master oscillator power amplifier (MOPA) with two-stage all fiber structure was adopted. In the preamplifier, gain medium was double-clad Yb-doped fiber with 7 $\mu$ m core diameter and average power of stable pulse output was 160mW. In the master amplifier, gain medium was double-clad Yb-doped fiber with 20 $\mu$ m core diameter and its output power was 16.60W while pump power increased to 35.37W. The corresponding single pulse energy was 1.63 $\mu$ J and peak power was 16.61kW. And then, output laser of master amplifier was injected into photonic crystal fiber of 4.6 $\mu$ m core via a home-made mode field adapter. 2.85W output power of white light supercontinuum was obtained and the supercontinuum spectrum wavelength covered the measured range from 600nm to 1700nm. The results show that this laser can be used for the generation of supercontinuum spectrum sources.

Keywords: fiber optics master oscillator power amplifier high pulse energy white light supercontinuum

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