国产掺 Tm^{3+}光纤光谱特性研究

电子科学与技术学院电子科学与技术专业　刘国平

（学号：2005111191）

指导教师：杜戈果

摘要：掺铥光纤激光器能产生 2μm 波长的激光，为生物医学、遥感探测以及光电对抗提供了有利工具。本文首先介绍了光纤激光器的结构、分类、优点；接着介绍了铥离子能级特点，分析了掺铥光纤激光器的工作原理和国内外发展现状。根据 Tm^{3+}的能级特点，选择了合适的泵浦方式，采用了几种不同的谐振腔，利用 785nm LD 泵浦源对国产掺铥双包层光纤进行了实验研究，产生了 2μm 波段的激光，输出功率 2.48W，斜率效率 61.50%，并利用光栅单色仪和光谱仪分别测试了激光光谱，对激光器输出特性进行了分析。最后对实验方案提出了改进意见。

关键词：光纤激光器；掺铥双包层光纤；LD 泵浦；2μm 激光

Experimental Research on Spectrum Characteristic of Domestic Tm^{3+}-doped Fiber

Abstract: The Tm^{3+}-doped fiber laser can produce laser of 2μm wavelength. It provides useful tools for biomedicine, remote sensing detection and optoelectronic counterwork. The thesis introduced the structure, classification and advantages of the fiber laser at first. According to the characteristics of Tm^{3+}'s energy level, the suitable pump method with several different resonant cavities was chosen. Research on the domestic Tm^{3+}-doped double cladding fiber was demonstrated pumped by a 785nm LD. The laser operated at 2μm wavelength. The output power was 2.48W, with the slope efficiency of 61.50%. The laser spectrum was also measured by using a monochromator and a spectrometer, respectively. Analysis was made on the output characteristics of the laser. Finally, suggestions of how to improve the experimental project were presented.

Key Words: Fiber laser; Tm^{3+}-doped double cladding fiber; LD pumping; 2μm laser

教师点评：本文主要对基于国产光纤的掺铥双包层光纤激光器进行了研究。用 785nm 激光器泵浦国产掺铥双包层光纤，采用三种不同的谐振腔方案，实现了激光振荡，测量了荧光谱、输出功率、工作波长，并对后续实验提出了建议方案。显示出刘国平同学具有较好的综合运用所学知识解决问题的能力。这是一篇优秀的毕业论文。