

光学计量与测试

PDLC调制法测试研究非线性材料的相关性能

任伟鸽¹;刘桂香²;胡银灿¹;王芬¹;谭炳辉¹;陶卫东¹

- 1. 宁波大学理学院, 浙江宁波315211;
- 2. 内蒙古科技大学包头师范学院物理系, 内蒙古包头014030

摘要:

针对粉末倍频测试过程中的信号溢出, 根据Kurtz理论和聚合物分散型液晶薄膜(polymer dispersed liquid crystal, 简称PDLC)的透光率对所加电场电压的响应原理, 提出PDLC调制入射基频光强, 进而控制测试信号的溢出。利用这一方法分别对碘酸钾、钽酸铯和钽酸铷等几种粉末样品的非线性倍频效应进行了测试分析。计算分析结果为: 碘酸钾能够实现相位匹配, 钽酸铯和钽酸铷不能实现相位匹配; 钽酸铯、钽酸铷的倍频效应分别约为氧化磷酸二氢钾(DKDP)的8.13倍和1.78倍。结果表明, 使用PDLC调制法所得的测试结果准确且操作简便。更重要的是, 此方法应用于定量测试倍频系数中, 可以有效提高测试精确度, 并且可应用于其他晶体非线性特性的测试研究。

关键词: 非线性光学 PDLC调制法 粉末SHG 相位匹配 光纤光谱仪

Measurement and research of the properties of the nonlinear materials by PDLC method

REN Wei-ge¹;LIU Gui-xiang²;HU Yin-can¹;WANG Fen¹;TAN Bing-hui¹;TAO Wei-dong¹

- 1. Faculty of Science, Ningbo University, Ningbo 315211, China;
- 2. Department of Physical Science, Baotou Teachers college, Inner Mongolia University of Science & Technology, Baotou 014030, China

Abstract:

According to the Kurtz's theory and the relation between the transmittance of the polymer dispersed liquid crystal (PDLC) and the applied voltage, for the signal overflow during the testing process, we proposed using PDLC film to modulate the incident fundamental light intensity to control the signal of the second harmonic generation (SHG). The powder samples of potassium iodate, cesium vanadate and rubidium vanadate were tested and analyzed by this method respectively. It can be derived that KIO₃ are phase-matchable, CsV₂O₅ and Rb₃V₅O₁₄ are not phase-matchable. The signals of CsV₂O₅ and Rb₃V₅O₁₄ is 8.13, 1.78 times that of potassium dideuterium phosphate(DKDP). The results show that this method is accurate, and easy to operate. More importantly, when applied to testing SHG coefficient quantitatively, this method can effectively improve measurement accuracy. It demonstrated that this method is feasible to test the non-linear characteristics of crystals.

Keywords: nonlinear optics PDLC modulation method powder SHG phase-matching fiber optic spectrometer

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通讯作者: 任伟鸽(1984-), 女, 河南开封人, 硕士研究生, 主要从事非线性光学材料测试及PDLC制备方面的研究。

作者简介:

作者Email: renweige030311@163.com

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