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双抽运光子晶体光纤光学参量放大器特性研究

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摘要 利用光子晶体光纤高非线性和低色散斜率的优良特性，提出了一种利用变换和缩放的四阶切比雪夫多项式计算双抽运光纤参量放大器平坦增益和带宽的方法．利用上述多项式的微小波动性，推导了放大器的增益和带宽表达式，进行了模拟分析，并与色散移位光纤参量放大器进行了比较．仿真结果表明，光子晶体光纤参量放大器具有优良的放大特性，其增益平坦度小于±0.5dB，增益带宽可达80nm．在此基础上，设计了一种新颖的可减小受激拉曼散射影响的双抽运光子晶体光纤参量放大器．

关键词 光纤光学参量放大器 光子晶体光纤 双抽运 色散特性 非线性 受激拉曼散射 增益带宽
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Numerical analysis of the two-pump fiber optical parametric amplifier based on the triangular photonic crystal fiber

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Abstract

Due to the PCF high nonlinearity and low dispersion slope, in order to obtain high flattened gain over a wide bandwidth of two-pump fiber-optic parametric amplifiers (2P-FOPA) based on the triangular photonic crystal fiber (PCF), the shifted and scaled fourth-order Chebyshev polynomial is presented. Using the above polynomial gain ripple characteristic, expressions for the gain and bandwidth are derived, and numerical simulations are performed. A comparison of its performance with that of FOPAs based on the dispersion-shifted fiber (DSF) is also made. It is shown that less than±0.5dB gain flatness can be obtained over the80nm bandwidth by the 2P-FOPAs based on the triangular photonic crystal fiber. Finally, a PCF-based fiber optic parametric amplifier to reduce the influence of stimulated Raman scattering (SRS) is designed.

Key words fiber optical parametric amplifier photonic crystal fiber two-pump dispersion profile nonlinearity stimulated Raman scattering gain bandwidth

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