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激光物理与激光器件

高相干度超连续谱的产生和脉冲压缩的研究

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摘要:

为了研究全波段正常色散光子晶体光纤中高相干度超连续谱的产生及其脉冲压缩,采用分步傅里叶法数值模拟了超短光脉冲在全波段正常色散光子晶体光纤中的非线性传输和超连续谱的产生;利用1阶相干因子分析了抽运波长和入射峰值功率对超连续谱相干特性的影响。结果表明,色散效应越弱,越有利于高相干度超连续谱的产生;在色散效应较小处抽运时,获得了带宽为587nm、平坦度小于7dB的高相干度的超连续谱;超连续谱的相干性越高,越有利于脉冲压缩,采用光栅对压缩器对高相干度超连续谱脉冲进行压缩,获得了8.4fs、压缩质量因子为88.88%的超短光脉冲。因此,抑止色散效应,利用自相位调制可获得高相干度的超连续谱及高质量的脉冲压缩。

关键词: 光纤光学 超连续谱 相干特性 脉冲压缩

Study on generation of high coherent supercontinuum and pulse compression

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Abstract:

In order to study the generation of high coherent supercontinuum and pulse compression in an all-normal dispersion photonic crystal fiber, the nonlinear propagation of an ultrashort pulse and supercontinuum generation in an all-normal dispersion photonic crystal fiber were simulated with the standard split-step Fourier algorithm. The impact of center wavelength and input peak power of the pump pulse on the coherence properties of supercontinuum was simulated and analyzed. It is found the weaker the dispersion effect is, the more advantageous to the high coherent supercontinuum generation. A high coherent supercontinuum with band width of 587nm and flatness of less 7dB can be obtained by pumping the fiber under which the dispersion effect is small. It is also found the higher the coherence properties of supercontinuum is, the more advantageous to the supercontinuum pulse compression. An ultrashort pulse with pulse duration of 8.4fs and compression quality factor of 88.88% can be obtained by using a grating pair compressor to compress the high coherent supercontinuum pulse. Therefore, the high coherent supercontinuum and high quality pulse compression can be obtained by using the effect of self phase modulation and suppressing the dispersion effect.

Keywords: fiber optics supercontinuum coherence characteristics pulse compression

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