光子学报 2013, 42(3) 293-297 DOI: 10.3788/gzxb20134203.0293 ISSN: 1004-4213 CN: 61-1235/O4

论文

InP阵列波导光栅的误差分析

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摘要:

在InP阵列波导光栅的制作过程中会引入不同的误差,从而影响器件的性能.为了最大限度地控制误差,提高半导体器件性能,本文采用传输函数法对InP基阵列波导光栅的系统误差和随机误差分别进行了分析.从系统误差的模拟结果中可以得到如下结论:深脊型波导的有效折射率n_c平均每偏移+0.000 1,中心波长偏移+0.05nm.相邻阵列波导长度差ΔL每偏移+0.01 μm,中心波长将偏移+0.44 nm.n_c和ΔL仅仅会影响到传输谱中心通道及其他各通道对应的波长,使得传输谱发生整体漂移,而信道间隔及串扰不会改变.罗兰圆半径R偏移不会影响器件的中心通道对应的波长,但会使其它通道对应的波长发生变化,最终使得信道间隔改变,R增加50 μm,信道间隔减小0.03 nm.从随机误差模拟结果中,得出:波导芯区折射率、上包层折射率、衬底折射率、波导宽度和波导芯层厚度的随机波动会对阵列波导光栅的串扰产生较大的影响.根据以上分析,可以通过控制不同参量来调节器件的中心波长以及信道间隔等来优化阵列波导光栅的光学性能.

关键词: InP阵列波导光栅 简单传输函数法:系统误差 随机误差

Error Analysis of InP Arrayed Waveguide Grating

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Abstract:

Errors will be introduced in the fabrication process of InP arrayed waveguide grating, consequently affect the performance. To control errors best, and improve the performance of the device, the systematic errors and random errors of InP-based arrayed waveguide grating was analyzed by adopting transmission function method. It is come to a conclusion from the simulation result of systematic errors that: the deviation of effective index of the deep-ridge waveguide n_c changes every 0.000 1, the central wavelength shifts 0.05 nm. The length difference of adjacent arrayed waveguides ΔL changes every 0.01 μm, the central wavelength shifts 0.44 nm. They will consequently cause the shift of whole optical spectrum, but the channel spacing and crosstalk will not be changed. The deviation of the radius of Rowland circle will not change the central wavelength but change the channel spacing. R increases every 50 μm, the channel spacing decreases 0.03 nm. According to the simulation result of random errors: the refractive index of core layer, the cladding layer and the substrate layer of the waveguide, the waveguide width and the thickness of core layer's random fluctuation can deep affect the crosstalk. According to the analysis above, central wavelength and channel spacing can be tuned by changing different parameters, thereby, improving the optical performance of the arrayed waveguide grating.

Keywords: InP arrayed waveguide grating Transmission function method Systematic errors Random errors

收稿日期 2012-08-30 修回日期 2012-11-07 网络版发布日期

DOI: 10.3788/gzxb20134203.0293

基金项目:

国家高技术研究发展计划光子集成技术与系统应用(No.2011AA010303);基金委重大项目-高速光电子集成基础研究(No.61090390);重点项目(No.60837001);面上项目(Nos.61275029,61274047)和青年科学基金项目(No.61205044)资助

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