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半导体光电

GaInAsP / InP阶梯量子阱中氢施主杂质束缚能

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摘要： 在有效质量近似下，利用变分法对GaxIn1-xAsyP1-y /InP阶梯量子阱中氢施主杂质束缚能进行了理论计算，并研究了外加电场和阶梯阱的高度对阶梯量子阱中氢施主杂质电子态特性的影响。计算结果显示当施主杂质位于阶梯量子阱的中心时，束缚能达到最大值；外加电场使得电子波函数从阱中心偏移，引起束缚能的非对称分布；Ga 与 As组分的变化使得阶梯阱的势能高度发生变化，从而明显的影响阱中氢杂质束缚能。计算结果对一些基于半导体阶梯型量子阱的光电子器件的设计制作有一定的指导意义。

关键词： 光电子学 束缚能 变分法 氢施主杂质 阶梯量子阱

Binding energy of hydrogenic donor impurity in GaInAsP / InP stepped quantum well

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Abstract: Within the framework of effective mass approximation, the binding energy of a hydrogenic donor impurity in GaxIn1-xAsyP1-y stepped quantum wells (SQWs) is theoretically calculated using the variational method. The influence of applied electric fields and SQWs height on hydrogenic donor impurity electronic state are investigated. The results show that the hydrogen impurity binding energy reaches its maximum when the donor impurity is located at the center of the stepped quantum wells. The applied electric fields drive the electron wave function away from the stepped quantum well center, and induce asymmetric distribution of the donor binding energy in the SQWs. The variation of Ga and As content leads to the corresponding changes in the stepped quantum well height, which significantly affects the binding energy of hydrogenic impurities in the stepped quantum wells. The results are meaningful and can be applied in the design of optoelectronic devices based on stepped quantum wells.

Keywords: optoelectronics binding energy variational method hydrogenic donor impurity stepped quantum well

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