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三维热传导型半导体器件瞬态模拟问题Crank-Nicolson差分-流线扩散有限元法及其数值分析

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摘要 本文研究三维热传导型半导体器件瞬态模拟问题的数值方法.

针对数学模型中各方程不同的特点, 分别提出不同的有限元格式. 特别针对浓度方程组是对流为主扩散问题的特点, 使用Crank-Nicolson 差分-流线扩散计算格式, 提高了数值解的稳定性. 得到的$\ssize L^2 $误差估计关于空间剖分步长是拟最优的, 关于时间步长具有二阶精度.

关键词 半导体,三维热传导,Crank-Nicolson格式,差分流线扩散法

分类号

C-N DIFFERENCE STREAMLINE DIFFUSION METHOD FOR THREE-DIMENSIONAL SEMICONDUCTOR PROBLEM WITH HEAT-CONDUCTION AND NUMERICAL ANALYSIS

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Abstract In this article, we study the numerical method for simulation of three-dimensional semiconductor problem with heat-conduction. Considering different types of partial differential equations arising from the model for the transient behavior of a semiconductor device, we present different finite element scheme respectively.Especially, we use Crank-Nicolson difference streamline diffusion method to treat convection-diffusion equations of the concentrations of electron and hole in the model. The numerical stability is improved by difference streamline diffusion method. An error estimate in L^{2} norm with quasi-optimal accuracy in space and second order accuracy in time is derived.

Key words Three-dimensional heat conduction semiconductor ddifference streamline difference streamline diffusion method

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