半导体器件瞬态模拟的对称正定混合元方法

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摘要　　提出具有对称正定特性的混合元格式求解非稳态半导体器件瞬态模拟问题.提出一个最小二乘混合元方法、一个新的具有分裂和对称正定性质的混合元格式和一个解经典混合元方程的对称正定迭代格式求解电场位势和电场强度方程;提出一个最小二乘混合元格式求解关于电子与空穴浓度的非稳态对流扩散方程,浓度函数和流函数被同时求解;采用标准的有限元方法求解热传导方程.建立了误差分析理论.

关键词　　半导体器件,数值模拟,最小二乘方法,混合元,误差分析

分类号

A SYMMETRIC POSITIVE DEFINITE MIXED FINITE ELEMENT METHOD FOR TRANSIENT SIMULATION OF A SEMICONDUCTOR DEVICE

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Abstract In this article,we present some symmetric positive definite mixed finite element methods to solve transient simulation of a semiconductor device with heat condution.Three mixed element procedures are introduced to treat equations of the electronic potential and intensity.The first is a least-squares mixed finite element scheme,the second is a new mixed element algorithm with splitting and symmetric positive definite properties and the third is a symmetric positive definite iterative algorithm for the classical mixed finite element method.A least-squares mixed finite element method is used to solve time-dependent convection-diffusion equations on concentrations of electron and hole,in which concentration equations and flux functions are solved simultaneously.A standard finite element method is used to solve equation of heat conduction.Convergence analysis of the numerical method is given.

Key words   Semiconductor device   numerical simulation   least-squares method   mixed element   error analysis

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