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论文

多晶硅表面陷阱坑形貌的光学性能模拟

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摘要:

采用COMSOL Multiphysics 3.5a有限元分析软件中的RF模块对3种硅片绒面的陷阱坑形貌(轻度腐蚀、正常腐蚀和过度腐蚀)的光学性能进行了数值模拟.通过求解麦克斯韦方程组和材料本构方程,获得了3种陷阱坑的表面电场*z*分量、表面磁场*y*分量和反射率的变化规律.结果表明:当波长为600 nm时,轻度腐蚀陷阱坑的表面电场*z*分量和表面磁场*y*分量的数值最小,反射率最高(约为35%);正常腐蚀陷阱坑的表面电场*z*分量和表面磁场*y*分量其次,反射率约为17%;过度腐蚀陷阱坑的表面电场*z*分量和表面磁场*y*分量的数值最大,反射率最低(约为10%).通过实验和模拟结果对比可知,模拟值和试验值的反射率变化趋势基本一致,两者吻合较好,可为实际生产和试验提供理论参考.

关键词: 多晶硅 陷阱坑 形貌 陷光 数值模拟

A Simulation Study on Optical Properties of Trap Pits Morphology of Multicrystalline Silicon

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Abstract:

Optical properties of trap pit morphology of multicrystalline silicon (weaklyetched, normaletched and heavyetched) were simulated by solving the Maxwell and material equations, using RF MODULE of COMSOL Multiphysics version 3.5a. The varying laws of surface electric field a component, surface magnetic field y component and reflectivity of three kinds of trap pits were obtained. It is indicated that the value of surface electric field *z* component and surface magnetic field y component of weaklyetched trap pit is the least, and its reflectivity is the highest(about 35%)at wavelengh of 600nm; followed by that of normaletched trap pit, its reflectivity is about 17%; the value of surface electric field *z* component and surface magnetic field *y* component of heavyetched trap pit is the most, its reflectivity is the lowest (about 10%). Compared the experimental date with the simulation results, change trend of numerical simulation results are accorded with that of experimental ones, which provided for the practice production of acidic texturing of multicrystalline silicon as theory bases.

Keywords: Multicrystalline silicon Trap pits Trap light Numerical simulation

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