

研究论文

掺氮纳米金刚石膜的制备和性能

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摘要: 以Ar、CH₄CO₂反应气源, 以三聚氰胺的甲醇饱和溶液为掺杂源, 微波等离子体化学气相沉积法在单晶硅基体上制备了掺氮的金刚石薄膜; 原子力显微镜、拉曼光谱以及霍尔效应测试仪等手段表征了膜的组成结构和半导体特性。结果表明: 掺氮的金刚石薄膜晶粒平均尺寸约为20 nm, 表面粗糙度约为8.935 nm, 拉曼光谱为典型的纳米金刚石膜特征峰形; 掺氮膜材的电导率高达 $0.76\times10^2\Omega^{-1}\text{cm}^{-1}$ 度达到 $2.18\times10^{19}/\text{cm}^3$ 是一种导电性能优良的n型半导体纳米金刚石膜。

关键词: 无机非金属材料 微波等离子体 化学气相沉积 n型掺杂 纳米金刚石薄膜

Preparation and Property of Nanocrystalline Diamond Film oped with N

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Abstract: Nanocrystalline diamond film doped with N was prepared on Si substrate by microwave lasma chemical vapor deposition (MPCVD) technology using Ar, CH₄, CO₂ as actiong gas source and he methanol saturated solution of melamine as doping source. The as-grown film was characterized with FM microscopy and Raman spectrum, the phase composition of diamond film was characterized by its ypical Raman spectrum form. Hall effect measurement was used to reveal its conductive feature. The esults show that the thin film has average crytalline grains nearly 20nm and fine surface roughness about 935nm, the nitrogen doped nanocrystalline diamond film is highly conductive n-type semiconductor with letric conductivity to $0.76\times102\Omega^{-1}\text{cm}^{-1}$ and carrier concentration to $2.18\times1019/\text{cm}^3$.

Keywords: inorganic non-metallic materials microwave plasma CVD n-type doping nanodiamond film

收稿日期 2010-09-07 修回日期 2010-12-07 网络版发布日期 2011-04-18

DOI:

基金项目:

国家自然科学基金委员会与中国工程物理研究院联合基金10876032和国防基础科研B3120090020资助项目。

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