

论文

水浴法制备ZnO纳米棒及其场发射性能

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摘要:

用硝酸锌 (Zn(NO₃)₂·6H₂O) 与六亚甲基四胺 (C₆H₁₂N₄) 以等浓度配制成反应溶液, 通过水浴法制备出了形貌可控的棒状ZnO纳米结构, 讨论了不同反应浓度及衬底对ZnO表面形貌的影响. 样品的XRD和扫描电子显微镜分析结果表明, 所得产物均为六方纤锌矿结构, 在有晶种层的衬底上制备出的ZnO纳米棒沿(001)方向并垂直于衬底表面生长. 随着反应浓度的增加, ZnO纳米棒的直径增大, 长径比减小. 样品的场发射性能测试表明, 反应溶液浓度为0.005 mol/L, 以铜膜为晶种层的硅衬底上制备出的场发射阴极具有较好的场发射性能.

关键词: 水浴法 ZnO纳米棒 晶种层 场发射

Preparation of ZnO Nanorods by Water Bath Method and Their Field Emission Properties

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Abstract:

By using water bath method that an aqueous solution of zinc nitrate (Zn(NO₃)₂·6H₂O) reacted with an aqueous solution of equimolar methenamine (C₆H₁₂N₄), ZnO nanomaterials with controllable morphologies are successfully prepared. The influences of solution concentration and substrates on morphology of ZnO nanomaterials are discussed. The results of XRD patterns, SEM micrographes reveal that ZnO nanorods are hexagonal wurtzite structure, which are along (001) direction, and are grown vertically on Si substrates with ZnO and copper seeded layers. With the increase of the concentration of aqueous solutions, the diameter of ZnO nanorods decreases and the ratio of diameter to length increases. The samples with different seeded layers (ZnO or Cu) have the same crystal structure, but exist some differences in shape. The field emission capability of the samples indicates that the field emission cathode prepared on Si substrate with copper film in 0.005 mol/L has excellent field emission properties, which field emission current is high and many dense and uniform luminescent centers could be observed when the anode is fluorescent glass.

Keywords: Water bath method ZnO nanorods Seeded layer Field emission

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