

The Electrical Characteristics of Argentum-Doped Zinc Oxide Nanorods and n-Type Silicon Heterojunctions

徐已侑、李世鴻

E-mail: 387145@mail.dyu.edu.tw

ABSTRACT

In this study, the p-ZnO/n-Si heterojunctions were formed by depositing argentum-doped zinc oxide (ZnO) nanorods on n-type silicon and their electrical characteristics were studied. argentum-doped ZnO nanorods were grown by a hydrothermal mechanism. First, ethyl alcohol (C₂H₅OH) was added to zinc acetate (Zn(CH₃COO)₂ · 2H₂O) to form a mixed solution. This mixed solution was then used to form a seeding layer on silicon substrate by spin coating. Subsequently, mixed solutions using 0.02M hexamethylenetetramine (C₆H₁₂N₄), 0.02M zinc nitrate hexahydrate (Zn(NO₃)₂ · 6H₂O), and silver nitrate (AgNO₃) of various concentrations were prepared. And the growth was carried out in the mixed solution at 90°C for two hours. Field-emission scanning electron microscopy (FE-SEM), energy dispersive spectrometer (EDS) were used to analyze the surface morphology and chemical compositions of ZnO nanorods. The conductivity type for Ag-doped ZnO nanorods is p-type indeed as was determined from Hall effect measurement, and majority carrier mobility and carrier concentration were determined. In addition, PL measurements were used to investigate the photoluminescence characteristics of Ag-doped ZnO nanorods. Finally, the Ag-doped p-type ZnO nanorods were fabricated on top of the n-type silicon substrate to form p-ZnO/n-Si heterojunctions, and the electrical characteristics of the heterojunction were determined.

Keywords : zinc oxide nanorods、heterojunctions、argentum-doped

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