Synthesis and characterization of GaN nanowires by vapor-liquid-solid mechanism

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ABSTRACT

A thermal chemical vapor deposition method was developed to prepare GaN nanowires with different diameters by Vapor-Liquid-Solid mechanism. GaN nanowires have been successfully synthesized on the GaN/Sapphire substrates deposited a gold film. The synthesis of GaN nanowires was carried out in a high-temperature tube furnace. Argon with the flow rate of 100sccm was introduced into the tube. The synthesis temperature and pressure were about 1000ºC and 1 atm, respectively. This synthesis method is simple and controllable; it may be useful in large-scale synthesis of various nanowires.

The GaN nanowires were characterized by X-ray diffraction (XRD) and field-emission scanning electron electron microscopy (FESEM). In this work, a gold film of 5~15 nm in thickness was deposited onto the surfaces of GaN/Sapphire substrate as the catalyst metal for nanowires growth. Analysis of a number of the nanowires shows that the diameters of nanowires vary from 148 to 180 nm, and the lengths are up to several micrometers, indicating a high aspect ratio. There appears to be strong correlation between the thickness of Au film and the diameter of the nanowires. The samples were examined with X-ray diffraction meter, all of the diffraction peaks were indexed and identified as the hexagonal wurtzite structure.

Keywords: GaN, nanowires, vapor-liquid-solid

REFERENCES

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