N-005

Synthesis of Hexagonal Boron Nitride Nanosheet by Diffusion of Ammonia Borane Through Ni Films

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Hexagonal boron nitride (h-BN) is a two dimensional material which has high band-gap, flatness and inert properties. This properties are used various applications such as dielectric for electronic device, protective coating and ultra violet emitter so on. 1) In this report, we were growing h-BN sheet directly on sapphire 2"wafer. Ammonia borane (H3BNH3) and nickel were deposited on sapphire wafer by evaporate method. We used nickel film as a sub catalyst to make h-BN sheet growth. 2) During annealing process, ammonia borane moved to sapphire surface through the nickel grain boundary. 3) Synthesized h-BN sheet was confirmed by raman spectroscopy (FWHM: ~30cm-1) and layered structure was defined by cross TEM (~10 layer). Also we controlled number of layer by using of different nickel and ammonia borane thickness. This nickel film supported h-BN growth method may propose fully and directly growing on sapphire. And using deposited ammonia borane and nickel films is scalable and controllable the thickness for h-BN layer number controlling.

Keywords: h-BN, Ammonia borane, Diffusion, 2D material

N-006

Selective Growth of Nanosphere Assisted Vertical Zinc Oxide Nanowires with Hydrothermal Method

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ZnO nanostructures have a lot of interest for decades due to its varied applications such as light-emitting devices, power generators, solar cells, and sensing devices etc. To get the high performance of these devices, the factors of nanostructure geometry, spacing, and alignment are important. So, Patterning of vertically- aligned ZnO nanowires are currently attractive. However, many of ZnO nanowire or nanorod fabrication methods are needs high temperature, such vapor phase transport process, metal-organic chemical vapor deposition (MOCVD), metal-organic vapor phase epitaxy, thermal evaporation, pulse laser deposition and thermal chemical vapor deposition. While hydrothermal process has great advantages-low temperature (less than 100°C), simple steps, short time consuming, without catalyst, and relatively ease to control than as mentioned various methods. In this work, we investigate the dependence of ZnO nanowire alignment and morphology on si substrate using of nanosphere template with various precursor concentration and components via hydrothermal process. The brief experimental scheme is as follow. First synthesized ZnO seed solution was spun coated on to cleaned Si substrate, and then annealed 350°C for 1h in the furnace. Second, 200nm sized close-packed nanospheres were formed on the seed layer-coated substrate by using of gas-liquid-solid interfacial self-assembly method and drying in vaccum desicator for about a day to enhance the adhesion between seed layer and nanospheres. After that, zinc oxide nanowires were synthesized using a low temperature hydrothermal method based on alkali solution. The specimens were immersed upside down in the autoclave bath to prevent some precipitates which formed and covered on the surface. The hydrothermal conditions such as growth temperature, growth time, solution concentration, and additives are variously performed to optimize the morphologies of nanowire. To characterize the crystal structure of seed layer and nanowires, morphology, and optical properties, X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM), Raman spectroscopy, and photoluminescence (PL) studies were investigated.

Keywords: Selective growth, Nanosphere lithography, ZnO, Nanowire, Hydrothermal, Low temperature