

Gallium arsenide nanowires formed by Au-assisted metal-organic chemical vapor deposition: effect of growth temperature

Abstract :

We have investigated the growth of gallium arsenide (GaAs) nanowires as a function of temperatures in metal organic chemical vapor deposition (MOCVD) to establish the mechanisms that govern wire growth and to optimize growth conditions. The growth follows the vapor-liquid-solid method by applying nanoparticle gold colloid as a catalyst to form a eutectic liquid alloy with the substrate. The semi-insulating undoped (111)B GaAs was first dipped in the poly-L-lysine solution before 30nm gold colloid was dropped on the substrate surface. Growth process in the MOCVD system was done at temperatures between 380 and 600°C with growth time set at 30 min. All the grown samples were analyzed using a field emission scanning electron microscope (FE-SEM) and scanning electron microscopy (SEM). With increasing temperature the nanowire height increases but leads to significant tapering of the nanowire due to competing growth at the (111) substrate surface. At low temperatures nanowires grown are cylindrical-shaped with diameter wires between 50 and 100 nm.