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Growth control of GaAs nanowires using pulsed laser deposition with arsenic over-pressure X.W. ZHAO, A.J. HAUSER, T. R. LEMBERGER, F.Y. YANG, Department of Physics, the Ohio State University — Using pulsed laser ablation with arsenic over-pressure, the growth conditions for GaAs nanowires (NWs) catalyzed by gold nanoparticles have been systematically investigated. The single-crystal structure and geometry of the NWs have been characterized for various growth conditions. Arsenic over-pressure with As2 molecules was introduced into the system by thermal decomposition of polycrystalline GaAs to control the stoichiometry and shape of the NWs during growth. GaAs NWs exhibit a variety of geometries under varying arsenic over-pressures. Without As2 over-pressure, branched growth of GaAs with uncontrollable size and geometry was observed due to the decomposition of GaAs NWs, producing metallic Ga which serves as catalysts for the branched growth of GaAs on the nanowire surfaces. Under optimal As2 over-pressure, at substrate temperature of 570 ?C, single-crystal GaAs NWs with uniform diameter of ∼50 nm, small diameter distribution, length over 20 micrometers, and thin surface oxide layer of ∼0.5 nm were obtained. X-ray diffraction results confirm the zinc-blende crystal structure of the GaAs NWs. A preliminary electrical characterization gives a linear I–V curve with a reasonable resistance, which leads to more thorough electrical characterization on GaAs NWs and device fabrication.

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