Investigation of SiGe MOS Devices Prepared by Liquid – Phase -Deposition

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ABSTRACT

Silicon dioxide (SiO_2) has been grown on SiGe film by using liquid-phase deposition (LPD) methods with H_2SiF_6 and H_3BO_3 at room temperature. In this study, the concentrations of H_2SiF_6 and H_3BO_3 were 0.4 and 0.01 M, respectively, for temperature of 30 °C. We found that the growth rate of SiO_2 would increase with increasing of temperature and H_3BO_3 concentration. No Ge pileup was found at interface of SiGe and SiO_2 by using Auger electron spectrometer (AES) and electron spectroscopy of chemical analysis (ESCA) showed that the Si-2p appears at 103.4 eV with a full width at half maximum (FWHM) of 1.48 eV. The infrared absorption spectrum of SiO_2 was measured by Fourier transform infrared spectroscopy (FTIR) and revealed that the wave numbers located 810 and 1100cm-1, belonging to to the bending stretching and vibration modes of Si-O-Si bonding, moreover a peak of Si-F bonding appeared at 933cm-1. A metal-oxide-semiconductor (MOS) device of SiGe was fabricated with above conditions. A leakage current density of 8.69×10-9 A/cm2 was found at 2 MV/cm. With increasing of temperature to 400 °C, the fixed oxide charge density and interface charge density were improver from 3.82×1010 cm- and 3.25×1011 eV-1cm-2 to 4.77×109 cm-2 and 1.15×1011 eV-1 cm-2, respectively. For a study of MOS photodetectors, the dark current was reduced from the non-annealed samples of 3.25 ×10-8A to 4.46×10-9A for the 400 °C annealed samples. The photo to dark current ratio was 3.17×104 for 200 °C annealed samples with 850 nm illumination. The responsivity was 0.567A/W for non-annealed samples. Keywords：liquid-phase deposition 、metal-oxide-semiconductor、photodetectors

Keywords : Liquid – Phase - Deposition Liquid – Phase - Deposition Liquid – Phase - Deposition

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