Study of SiGe Metal-Semiconductor-Metal Photodetector with a-Si:H Capping Layer

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ABSTRACT

The SiGe badsed metal-semiconductor-metal photodetectors (MSM-PDs) has been fabricated in this work, in which the Si0.8Ge0.2 layer is grown onto n-Si substrate by ultra-high-vacuum chemical-vapor-deposition (UHV-CVD) system. In our structure, a thin hydrogenated intrinsic amorphous silicon (i-a-Si:H) layer is processed onto SiGe surface to suppress the dark current of this structure. The i-a-Si:H layer is deposited by using plasma-enhanced chemical-vapor-deposition (PECVD) system. The MSM-PDs without a have a high dark current of 6.58×10-3A at a bias voltage of 10 V, however, the dark current is only 2.16×10-7A for with a thin i-a-Si:H one. The photocurrent of sample with a thin i-a-Si:H is 2.51×10-5A, and thus a photo-to-dark current ratio (Iphoto/ Idark) of 102 is achieved for 850 nm infrared laser illuminated Additionally, we try to deposit an oxide passivation layer between fingers on Si0.8Ge0.2 layer by liquid-phase-deposition (LPD) technique. Compared with the MSM-PDs without LPD oxide passivation layer , the dark current of MSM-PDs with LPD oxide layer is reduced from 1.73×10-4A to 4.93×10-5A at a bias voltage of 2 V, after annealing the dark current is reduced further to 1.67×10-5A.

Keywords : MSM-PDS, A-SI:H, SIGE, DARK CURRENT, LPD OXIDE

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