Semiconducting diamond has much attention as a material for power devices owing to its high breakdown characteristics and high carrier mobility in high-temperature, high-voltage environments.[1] Recently, the development of a diamond Schottky barrier diode (SBD) that exhibited stable performance at temperatures greater than 200°C has been reported.[2] For the development of high-performance devices, the density of defects is suggested as a critical issue by several research groups [3,4]. They suggested that a high-quality crystal with a flat surface and a low defect density is required for high and stable performance.

In this study, we show the reverse leakage current of some SBDs and the distribution of dislocations in the area of the each Schottky electrode.

Two experimental data are shown in this abstract as examples. Figure 2 is the microscope image of electrodes which is overlaid on the XRT image. Ohmic electrodes were deposited on the four corners and the Schottky electrodes of various sizes were formed on the center area. I-V characterized electrodes are 200 µm in diameter, because these are with various dislocation densities in p-layer. The dislocation density is between $3\times10^3$ cm$^{-2}$ and $8.9\times10^4$ cm$^{-2}$.

Expanded images of XRT are shown in Figs. 2. Diffraction vector is <0-44>. Schottky electrode is deposited at both areas in Figs. 2. Figure 2a is the area having low leakage current characteristics and Fig. 2b is the area having the high leakage current characteristics. Because the dislocation density of Fig. 2a is lower than Fig. 2b, it is assumed that the SBD character is depend on the dislocation density.

In the presentation, we will discuss the relationship between the I-V character and dislocations in drift layer with more XRT data.

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References:


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