

# Al<sub>2</sub>O<sub>3</sub>/NO<sub>2</sub> ホールドーパダイヤモンド MOS 構造の C-V 測定におけるゲート金属の影響

Influence of gate metals on Al<sub>2</sub>O<sub>3</sub>/NO<sub>2</sub> hole doped diamond MOS structure  
studied by C-V measurements

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## 1.Introduction

Diamond is preferred for the high-power and high-frequency transistor. H-diamond field effect transistors (FET) exhibit high DC and RF performance [1-3]. Normally, Al is used as the gate metal contact for the FET structure. In this work, influence of different gate metals on Al<sub>2</sub>O<sub>3</sub>/NO<sub>2</sub>/H-diamond metal-oxide-semiconductor (MOS) will be investigated in order to improve the device performance.

## 2. Fabrication and Measurements

The samples are diamond MOS structures with NO<sub>2</sub> hole doping which consist of 32-nm-thick Al<sub>2</sub>O<sub>3</sub>, and 1-μm thick (001) H-diamond homo-epitaxial layer. We compared electrical characteristics of H-diamond MOS structures with three types of gate metals, Al (200-nm), Ti (50-nm)/Au (50-nm)/Al (100-nm) and Au (50-nm)/Al (150-nm).

## 3. Results and Discussion

Capacitance-voltage (C-V) characteristics of fabricated MOS structures are showing in Fig.1. Measurements were performed at 100 kHz and room temperature in dark. Fabrication conditions were same for all the samples. However, the MOS with Ti/Au/Al gate metal contact has the highest capacitance in the accumulation state at high forward (negative) bias. MOS with Al and Au/Al gate metal have the second highest and lowest accumulation capacitance, respectively. Flat band voltages of the fabricated MOS structure could be varied owing to different surface barrier heights of metals. Flat-band voltages of the MOS structures with Al gate metal is 2.35 V, with Au/Al gate metal is 1.9 V and with Ti/Au/Al is 1.6 V. Current-

voltage (I-V) characteristics of the MOS structures measured and gate leakage currents were investigated, where it was found that all the samples exhibit same range ( $\sim 10^{-8}$  to  $\sim 10^{-7}$  A/cm<sup>2</sup>) of gate leakage current.

## 4.Conclusion

We fabricated diamond MOS structures with different gate metal contacts and compared C-V characteristics to understand the influence of these metals on the MOS structure.

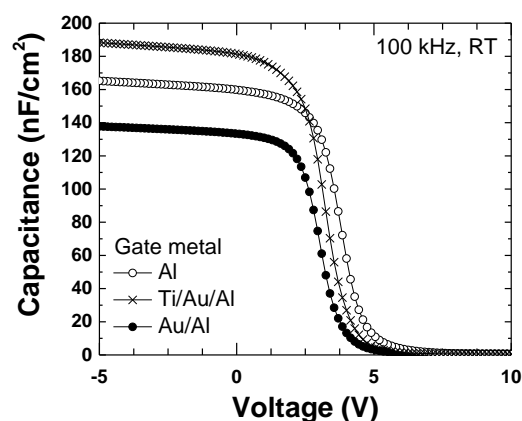


Fig. 1 C-V curves of Al<sub>2</sub>O<sub>3</sub> layer deposited NO<sub>2</sub> hole doped H-diamond MOS structures with three different gate metal Al, Ti/Au/Al, and Au/Al, respectively.

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## References

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