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Characteristics of Al_2O_3 film by introducing additional oxygen and oxygen vacancy using Pt catalytic KAZUYA YUGE, Shibaura Institute of Technology, TOSHIHIDE NABATAME, AKIHIKO OHI, NAOKI IKEDA, TOYOHIRO CHIKYOW, National Institute for Materials Science, TOMOJI OHISHI, Shibaura Institute of Technology — Al_2O_3 is an attractive gate insulator for gallium nitride power device. It remains a big issue of mobility degradation because of oxygen vacancy (Vo) of Al_2O_3 film. Furthermore, little is known about influence of the Vo of Al_2O_3 on transistor property. In this paper, we study characteristics of Al_2O_3 insulator by introducing additional oxygen and Vo. We prepared p-Si(100)/SiO_2/Al_2O_3/Pt capacitors. These capacitors were annealed at 300 - 600 C in N_2, O_2 and 3% H_2 ambient to introduce additional oxygen and Vo into Al_2O_3 using Pt catalytic effect. The fixed charge density in Al_2O_3 film was negligible small from linear relationship between Vfb and Al_2O_3 thickness. The Vfb shift of capacitors which annealed at 300 - 600 C in N_2 ambient exhibited about +0.6 V compared to the ideal Vfb. This is dominantly due to the dipole at Al_2O_3/SiO_2 interface. In contrast, the Vfb shift increased from +0.6 to +1.9 V with increasing the annealing temperature in O_2 ambient. The strength of the dipole increase because additional oxygen introduced by Pt catalytic effect piled up at Al_2O_3/SiO_2 interface. This suggests that the oxygen concentration at Al_2O_3/SiO_2 interface plays an important role of Vfb shift.

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