

## Motivation

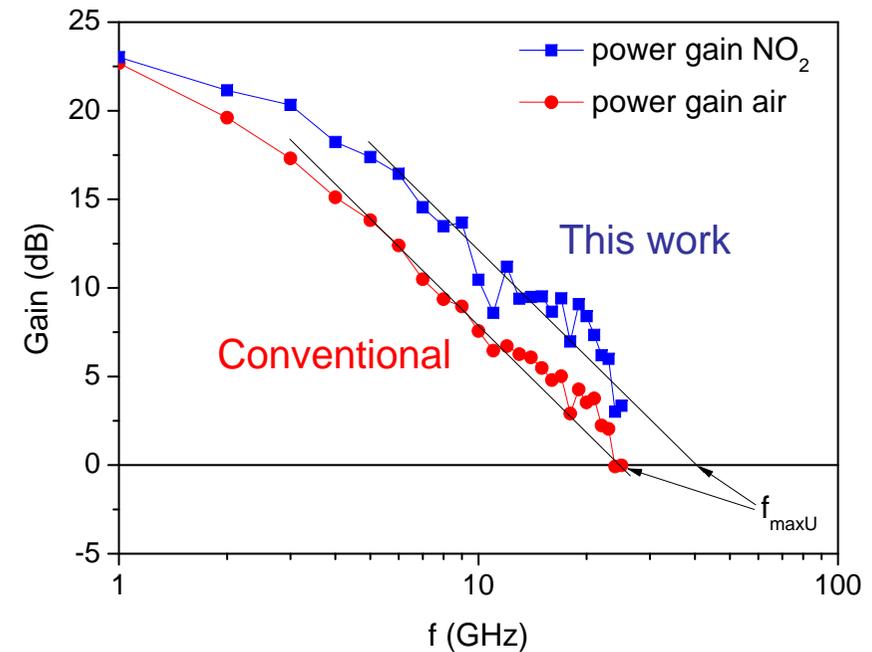
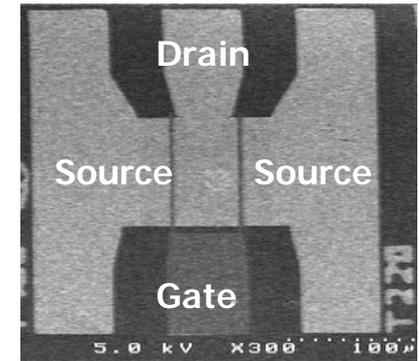
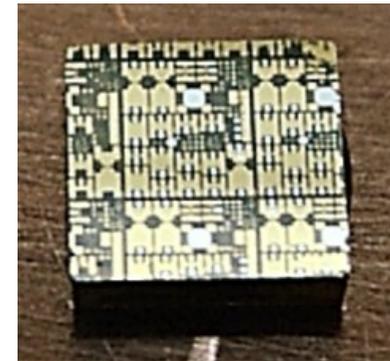
Diamond transistors are expected to provide the best performance among semiconductors in high-frequency high-power operation, because diamond has very high carrier velocity, the highest breakdown electric field strength, and the highest thermal conductivity. However, the mechanism of hydrogen termination, p-type doping, used in diamond transistors has not been clarified and the hole concentration has been limited.

## Originality

NTT has experimentally clarified that NO<sub>2</sub> is the most beneficial as p-type dopant, when doped intentionally to diamond and the hole concentration increased by one order of magnitude. With this technology, we fabricated diamond FETs, which show 1.8 times higher drain current and 1.5 times higher power-gain cut-off frequency.

## Impact

Diamond devices will one day replace the vacuum tubes now used in the very-high-frequency, very-high-power region, as they will fulfill increased output power requirements for communications satellites, television broadcasting stations, and radar systems.



RF frequency dependence of current gain and power gain

