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Atmospheric Pressure Thermal-Plasma-Jet Oxidation of 4H-SiC
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University — One of the most serious problem to improve the performance of SiC-
MOSFET is existence of a large amount of interface state between the insulating film
and SiC substrate. It is considered that these defects occur due to carbon desorp-
tion during oxidation process. In order to contribute to find solutions for this issue,
further investigation of oxidation of SiC wafer is necessary. We have investigated the
method of high temperature and rapid oxidation of SiC wafer using atmospheric-
pressure thermal-plasma-jet (TPJ) in an atmospheric ambient. TPJ oxidation can
provide rapid heating and cooling, and higher oxidation temperature which are dif-
ficult to realize by other equipment. This study demonstrates oxidation of 4H-SiC
using proposed TPJ oxidation, and intends to obtain knowledge about oxidation at
over 1300 °C. For the sample oxidized at 1480 °C on average, 18.7 nm SiO₂ layer
was formed within 30 s, and the interface state density of $2.3 \times 10^{12} \text{ cm}^{-2}\text{eV}^{-1}$ at
0.2 eV from the conduction band edge was obtained. This value is comparable to
that of the sample of dry oxidation at 1200 °C. In addition, TPJ oxidation has a
possibility of a reduction of oxidation time and process costs, because its oxidation
rate was about four times as large as that of dry oxidation at 1300 °C.

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