

## **Fabrication of Cylindrical Silicon Nanowire-Embedded Field Effect Transistor Using Al<sub>2</sub>O<sub>3</sub> Transfer Layer**

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**Abstract :** In order to manufacture short gap single Si nanowire (NW) field effect transistor (FET) by imprinting and transferring method, we introduce the method using Al<sub>2</sub>O<sub>3</sub> sacrificial layer. The diameters of cylindrical Si NW addressed between Au electrodes by dielectrophoretic (DEP) alignment method are controlled to 106, 128, and 148 nm. After imprinting and transfer process, cylindrical Si NW is embedded in PVP adhesive and dielectric layer. By curing transferred cylindrical Si NW and Au electrodes on PVP-coated p++ Si substrate with 200nm-thick SiO<sub>2</sub>, 3μm gap Si NW FET fabrication was completed. As the diameter of embedded Si NW increases, the mobility of FET increases from 80.51 to 121.24 cm<sup>2</sup>/V•s and the threshold voltage moves from -7.17 to -2.44 V because the ratio of surface to volume gets reduced.

**Keywords :** Al<sub>2</sub>O<sub>3</sub> sacrificial transfer layer, cylindrical silicon nanowires, dielectrophoretic alignment, field effect transistor

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