Estimation of conduction at CNT/SiC interface of vertically aligned and high density CNT on SiC

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CNT forest is important for metallization. Metallic properties of CNT forest for Si-ULSI via structure have been reported. However, CNT effective density is still not so high for large current density. CNT synthesized with SiC surface decomposition method (CNT on SiC) exhibits the most densely packed CNT forest and has graphene sheets vertical to the SiC surface. Although metal/SiC interface is crucial to power device application of SiC, only one report shows electric property of CNT/SiC interface, where the presence of Schottky barrier has been reported. Here, quantitative current behavior at CNT/SiC interface is estimated.

Because of lateral conduction in CNT forest on SiC, isolated CNT area was formed with focused ion beam and was scanned by conductive AFM. CNT forest/SiC contact resistivity was lower than 5\times10^{-9} \text{ohm-cm}^2 as reported previously. The conductivity depends on the isolated area and contact resistivity on CNT/SiC interface is evaluated to be about 10^{-2} \text{ohm-cm}^2. Note that the conduction shows the existence of optimal CNT length for contact. Contacting quality depends on CNT surface and CNT/SiC interface condition. When CNT length is less than 40 nm, initial graphene sheets remains and impedes vertical conduction. In the case of longer as 200nm, graphite structure parallel to CNT/SiC observed at the interface by cross sectional TEM and increase the contact resistance as a result. The smallest contact resistance at CNT/SiC has been obtained with CNT length at 100 nm, where the clearest vertical aligned CNT contact to SiC has been imaged by TEM.