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Thermal Conductance of Epitaxial and Transferred CVD-Grown Graphene HUANG BIN, KOH YEE KAN, Natl Univ of Singapore — The knowledge of how heat is carried across graphene-copper interface is crucial for the development of graphene devices with hybrid graphene-copper interconnects. Time-domain thermoreflectance (TDTR) is used to measure the interfacial thermal conductance of epitaxial grown single layer graphene (SLG) on copper foil and after it is transferred to a deposited copper substrate. It is found out that the thermal conductance of un-annealed transferred SLG on deposited copper is around 20 MW/m^{2}K, much lower than that of SLG grown on copper foil which is approximately 30 MW/m^{2}K. Annealing in forming gas/vacuum causes the thermal conductance of transferred SLG to increase to 31 MW/m^{2}K. X-ray spectroscopy (XPS) and Atomic force microscopy (AFM) are then employed to investigate the various factors, (i.e., copper oxide, polycarbonate (PC) residue, roughness and conformity) that may cause a difference in thermal conductance after the transfer. XPS measurement results show an absence of PC residue, even before annealing. The results also reveal that annealing in forming gas reduces the copper oxide thickness by about 2.5nm, and such a small reduction in oxide thickness is not sufficient to cause a drastic increase of approximately 10MW/m^{2}K in thermal conductance. AFM results show that before annealing, the SLG has elongated ridges-like morphology. This morphology is different from that of copper which has circular-like features. After annealing, the SLG morphology becomes very similar to that of copper – both exhibiting circular-like features. This shows that the SLG can conform better to the copper surface after annealing.

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