The effects of the crystalline orientation of Cu domains on the formation of nanoripple arrays in CVD-grown graphene on Cu

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Among the various defect structures of graphene, the formation of periodic nanoripple array and surface roughening intrinsically occurs as graphene grows on the surface of metal catalyst during chemical vapor deposition, which results in anisotropic charge transport and limits to the possible sheet resistance. In this study, we observed that among the various growth factors crystalline orientation of Cu domains can play an important role in the occurrence of periodic surface roughening. Surface of Cu domains except Cu (111) domain is considerably rippled to particular direction with abundant terrace structure and step edges to relax the strain from large lattice mismatch between graphene and Cu lattice at high temperature during CVD process, which remain as rippled regions of graphene after wet transfer. However, relatively flat surface is observed in the graphene transferred from hexagonal Cu (111) domain. Additional conductivity mapping also reveals that graphene from Cu (111) domain shows highly homogeneous current distribution. On the other hand, different conductivity on rippled regions introducing anisotropic transport of current is observed in the graphene from Cu domains except Cu (111) domain.