Electronic Supplementary Material (ESI) for Nanoscale

SUPPLEMENTARY INFORMATION

Penetration and Lateral Diffusion Characteristics of Polycrystalline Graphene Barriers

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Annealing of the bilayer graphene on metal under higher temperatures and longer times

We changed annealing times and temperatures for the formation of metal oxide in the bilayer graphene sample, and it was characterized by SEM as shown in Fig. S1. The metal oxide evolved as temperature and time increases. The oxide pattern was spot-like rather than line-like because bilayer graphene has point defects at the intersection of line defects from two separate graphene layers. Although metal oxidation occurred in the bilayer graphene sample, the oxidized region is smaller than the monolayer graphene sample as shown in Fig. S2. Therefore, we conclude that bilayer graphene still impedes the metal oxidation under severe heating conditions.

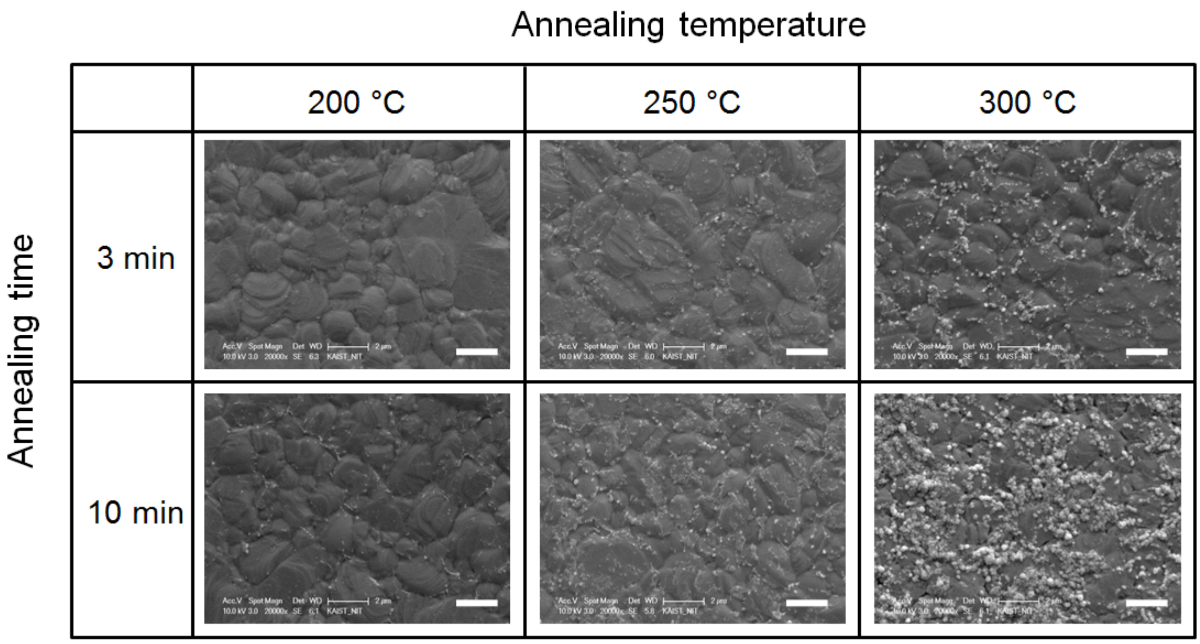

Figure S1. SEM images of the heated bilayer graphene on metal. Metal oxides gradually evolve as time and temperature increase. The scale bars are 2 μm.

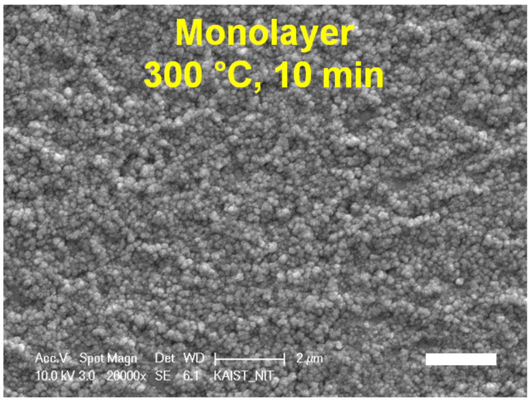

Figure S2. SEM image of the heated monolayer graphene on metal. The entire metal surface is covered by metal oxide at 300 °C and 10 minutes. The scale bar is 2 μm.