Structural characterization of few-layer graphene and graphite thin films grown using CVD

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Graphene is an atomically thin two-dimensional material with excellent electrical conductivity, mechanical strength, optical transparency (97.3%), and impermeability. Being promising for a wide range of applications, it has captivated the attention of the scientific community for the past decade [1-3]. Both the scientific community and commercial companies made several attempts to mass-produce graphene films. However, there is still a vast difference in the homogeneity of graphene synthesized on a laboratory and industrial scale [1]. Also, the structural quality varies enormously depending on the synthesis method. To produce high-quality graphene films (at large-scale and low-cost), chemical vapor deposition (CVD) is considered as a promising method [1,4]. Here, I will present our recent efforts towards the growth of high-quality, wafer-scale few-layer graphene (FLG) [5] and graphite thin films (GTF) using the CVD method. For this, process parameters and catalyst material (Cu, Ni, Cu-Ni alloy) were optimized. The crucial role of the catalyst thickness and surface topography in controlling the number of layers (few to few-hundreds of graphene layers) and surface defects (folds, kinks, etc.,) was investigated using transmission electron microscopy (TEM). Based on our results, further insights to control the number of graphene layers and surface defects by catalyst material engineering will be discussed.

References:
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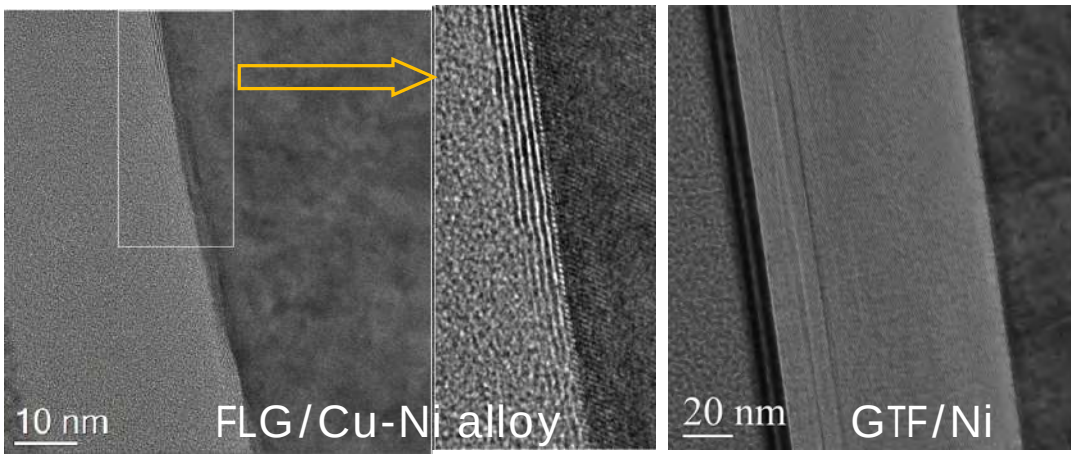

Figure 1. Cross-section TEM images of few-layer graphene on Cu/Ni alloy and GTF on Ni