

Raman spectroscopy study of graphene on Ni(111) and Ni(100)

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Graphene is a 2-D sheet of sp^2 -bonded carbon arranged in a honeycomb lattice. This material has attracted major interest, and there are many ongoing efforts in developing graphene devices because of its high charge mobility and crystal quality. Therefore clear understanding of the substrate effect and mechanism of synthesis of graphene is important for potential applications and device fabrication of graphene. In a published paper in J. Phys. Chem. C (2008), the effect of substrate on the atomic/electronic structures of graphene is negligible for graphene made by mechanical cleavage. However, nobody shows the interaction between Ni substrate and graphene. Therefore, we have studied this interaction.

In order to studying these effect between graphene and Ni substrate, We have observed graphene synthesized on Ni substrate and graphene transferred on SiO_2/Si substrate through Raman spectroscopy. Because Raman spectroscopy has historically been used to probe structural and electronic characteristics of graphite materials, providing useful information on the defects (D-band), in-plane vibration of sp^2 carbon atoms (G-band), as well as the stacking orders (2D-band), we selected this as analysis tool.

In our study, we could not observe the doping effect between graphene and Ni substrate or between graphene and SiO_2/Si substrate because the shift of G band in Raman spectrum was not occurred by charge transfer. We could noticed that the bonding force between graphene and Ni substrate is more strong than Van de Waals force which is the interaction between graphene and SiO_2/Si . Furthermore, the synthesized graphene on Ni substrate was in compressive strain. This phenomenon was observed by 2D band blue-shift in Raman spectrum. And, we consider that the graphene is incommensurate growth with Ni polycrystalline substrate.