Jiyun Moon
Seung-il Kim,Jae-Hyun Lee
Ajou University, 206,World cup-ro,Yeongtong-gu, Suwon, Korea

jaehyunlee@ajou.ac.kr

Environmental-friendly Dry transfer method for large scale CVD- graphene using MoO_3 layer

Since the first realization of large-area graphene synthesized through chemical vapor deposition (CVD) method in 2009,[1,2] subsequent research for the commercialization of the CVD-graphene has been tremendously conducted. As a result, crystallinity and properties of the CVD-graphene became almost comparable with those of the graphene by mechanical exfoliation from the highly-oriented pyrolytic graphite (HOPG).
However, CVD-graphene essentially have transfer step to semiconducting or insulator substrate to realize the graphene based electronics because of metal catalyst as a growth substrate and it bring the unavoidable contamination and environmental problems.[3,4]
In this conference, we will introduce eco-friendly and chemical free graphene transfer approach that clear up the aforementioned problems. By exploiting water-soluble inorganic MoO_3 supporting layer, we transferred the CVD-graphene grown on hydrogen terminated Ge substrate to target substrate. MoO3 film effectively protects the graphene from physical destruction and chemical contamination, And that it is completely washed away using only deionized (DI) water without any wet chemical etching process.
In addition, since the as grown graphene can be clearly separated from the Ge substrate, the remaining Ge substrate can be recycled multiple times as the catalyst substrate for high crystalline graphene growth. We also fabricate the back-gated graphene field effect transistors (GFET) to verify that electrical characteristics of graphene are maintained despite the repeated growth process and demonstrate that there are no degradation of crystallinity of graphene grown on multiple used Ge substrate.
We believe that our approach could be expected to contribute to the commercialization of graphene.

References

[1] K.S. Kim, Y. Zhao, H. Jang, S.Y. Lee, J. M. Kim, K. S. Kim, J. H. Ahn, P. Kim, J.Y. Choi and B. H. Hong , Nature, 457 (2009) 706-710
[2] X. Li, W. Cai, J. H. An, S. Y. Kim, J. H. Nah, D. Yang, R. Piner, A. Velamakanni, I. H. Jung, E. Tutuc, S. K. Banerjee, L. Colombo and R. S. Ruoff, Science, 324 (2009) 1312-1314
[3] X. Li, Y. Zhu, W. Cai, M. Borysiak, B. Y. Han, D. Chen, R. D. Piner, L. Colombo and R.S. Ruoff, Nano Letters, 9 (2009) 4359-4363
[4] X. Liang, B. A. Sperling, I. Calizo, G.J. Cheong, C. A. Hacker, Q. Zhang, Y. Obeng, K. Yan, H. Peng, Q. Li, X. Zhu, H. Yuan, A. R. H. Walker, Z. Liu, L. Peng and C. A. Rechter, ACS Nano, 5 (2011) 9144-9153

Figures

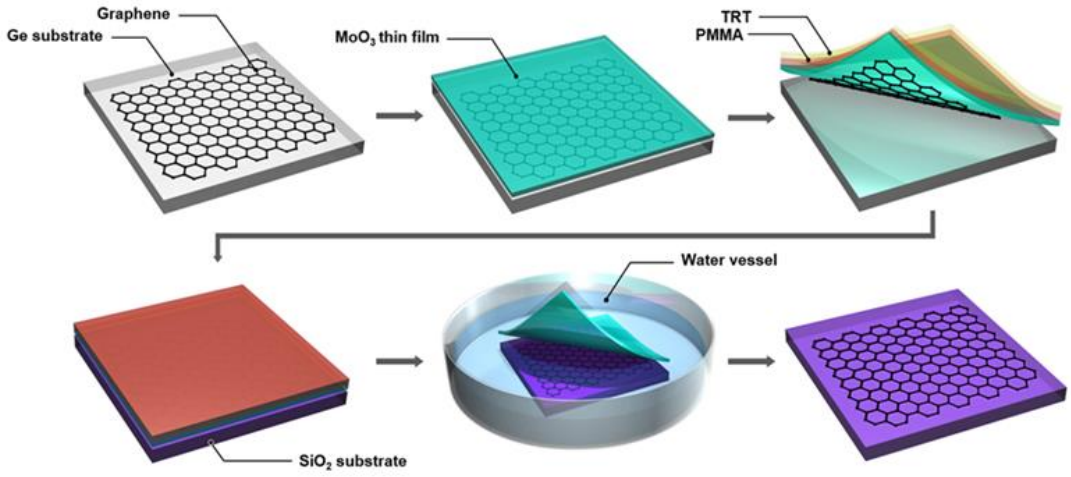

Figure 1: Schematic illustration of the MoO3 assisted transfer process of graphene onto a SiO2 substrate.