Kwang-Seop Kim[1,2]
Chan Kim[1,2], Min-Ah Yoon[1,2], Jae-Hyun Kim[1,2]
[1] Nano-Convergence Mechanical Systems Research Division, Korea Institute of Machinery & Materials (KIMM), 156 Gajeongbuk-ro, Yuseong-gu, Daejeon, Republic of Korea
[2] Department of Nano-Mechatronics, Korea University of Science and Technology (UST), 217 Gajeong-ro, Yuseong-gu, Daejeon, Republic of Korea
kskim@kimm.re.kr

Effect of Adhesive Layer Thickness on Graphene Transfer

Graphene is considered as one of the materials of transparent electrodes of future flexible electronic devices due to its excellent mechanical properties, electrical and thermal conductivity and transparency. In order to use large-area chemical vapor deposition (CVD) graphene on copper or nickel as an electrode of transparent flexible electronic devices, a technique of transferring a large area CVD graphene from the metal catalysis onto a target flexible substrate is required[1, 2]. In dry transfer process, a carrier film with a thin adhesive layer is widely used to transfer a large-area graphene [3, 4]. However, physical defects such as tearing of the graphene occur due to the adhesive property of the adhesive layer present in the carrier film. The quality of graphene transferred by dry transfer process is worse than that of graphene transferred by wet transfer process. Therefore, it is necessary to develop a dry transfer process capable of transferring a large area graphene without deteriorating the quality of graphene.

In the study, we investigated the effect of adhesive layer thickness on the quality of graphene transferred onto silicon wafer (SiO_2) through a dry transfer process. When the thickness of the adhesive layer is too thick, the lateral strain increases significantly due to the contact load and the graphene is fractured during transfer. If the thickness of the adhesive layer is too thin, an adhesion instability occurs when peeling off the carrier film, and the graphene is easy to tear. We optimized the thickness of the adhesive layer to minimize the defects on the transferred graphene on SiO_2 and the sheet resistance of the graphene was comparable to the graphene transferred by a wet transfer process.

References

[1] X. Li, W. Cai, J. An, S. Kim, J. Nah, D. Yang, R. Piner, A, Velamakanni, I, Jung, E. Tutuc, S. K. Banerjee, L. Colombo, R. S. Ruoff, Science 324 (2009)1312-1314.
[2] S. Bae, H. Kim, Y. Lee, X. Xu, J. S. Park, Y. Zheng, J. Balakrishnan, T. Lei, Hye. R. Kim, Y. I. Song, Y. J. Kim, K. S. Kim, B. Ozyilmaz, J. H. Ahn, B. H. Hong, S. Iijima, Nat. Nanotechnol. 5 (2010) 574-578.
[3] X. D. Chen, Z. B. Liu, C. Y. Zheng, F. Xing, X. Q. Yan, Y. Chen, et al., Carbon 56 (2013) 271-278.
[4] J. Ryu, Y. Kim, D. Won, N. Kim, J. S. Park, E. K. Lee, et al., ACS Nano 8 (2014) 950-956.

Figures

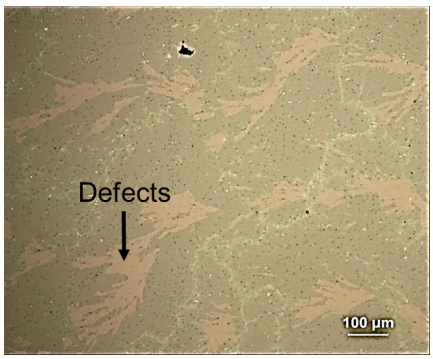

Figure 1: Defects on the graphene transferred by a thin adhesive layer