New Application of Graphene for Advanced Lithography

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Abstract

Graphene is a crystalline allotrope of carbon in the form of 2-dimensional, hexagonal network comprising sp^2 configuration. Due to its unique properties including high electronic and thermal conductivities, excellent mechanical strength, and impermeability to gases, graphene has become one of the most investigated nanomaterials.[1,2] Various application have been suggested, including flexible electronics, optoelectronic devices, and energy devices. [3-5]
We focused on the high chemical stability of graphene, which were originated from its strong intra-layer bonding and no dangling bond in the basal plane. We suggest a new application of graphene as an intermediate resist for patterning process in Si technology. Downscaling of the device has been one of the serious issues in the integration of semiconductor devices, in order for increasing chip density. As feature sizes have diminished, direct pattern transfer from typical photoresist can no longer attain fine patterns with high resolution, owing to the poor etch selectivity. The high etch resistance of graphene derived from its excellent mechanical property and chemical inertness allows fine patterns with high aspect ratio when using it as an intermediate resist during pattern transfer.
In this talk, we will cover and discuss the possibility of Graphene as an intermediate resist in manufacturing Si devices.

References

[1] Y. Zhu, S. Murali, W. Cai, X. Li, J. W. Suk, J. R. Potts, R. S. Ruoff, Adv. Mater., 22 (2010) 3906
[2] M. J. Allen, V. C. Tung, R. B. Kaner, Chem. Rev., 110 (2010) 132
[3] P. Avouris, Z. Chen, V. Perebeinos, Nature Nanotech., 2 (2007) 605
[4] Q. Bao, K. P. Loh, ACS Nano, 6 (2012) 3677
[5] Y. Sun, Q. Wu, G. Shi, Energy Environ. Sci., 4 (2011) 1113