IBS Center for Multidimensional Carbon Materials

Tuesday Colloquium

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Graphene Domain Analysis using Liquid Crystal Texture

Tuesday, JAN 12
4 PM

Bldg. 101
Seminar room on the 1st floor

The boundaries between domains in graphene materials strongly influence its electronic, mechanical, magnetic and thermal properties. However, existing approaches for domain visualization, which are based on electron microscopy and spectroscopy, are only effective for domains that are less than a few micrometres in size and need much time and efforts to analyze the domain structures. Here, we report a simple method for the visualization of arbitrarily large graphene domains by imaging the birefringence of a graphene surface covered with nematic liquid crystals. The method relies on a correspondence between the orientation of the liquid crystals and that of the underlying graphene, which we use to determine the boundaries of macroscopic domains. And we discovered the relationship between Cu domain and grown CVD domain structure by using this method. The sizes and shapes of domains of graphene grown on various Cu substrates well match those of the underlying Cu (111) domains. In contrast, other Cu domains, such as (100) and (101) do not strongly influence the domain structures of graphenes and furthermore, graphene islands with poly-domains (*ca.* 90%) are significantly nucleated, which play a role in the formation of poly crystalline graphene. We also discuss LC texture of other 2D materials including MoS_2. This technique should therefore open a new direction for studies directed at the elucidation of factors that control the domains, structures and properties of graphene, which is critical to realizing their potential applications.

References

Kim, D.W.; Kim, Y. H.; Jeong, H. S.; Jung, H.-T. Nature nanotechnology, 7 (2012) 29.
Kim, D.W.; Kim, J.S.; Kim, S.J.; Choi, H.O.; Kim, Y.H.; Jung, H.-T. Nano Letters, 15 (2015) 229.

You are cordially invited to attend!