Graphene on Polycrystalline Ni Thin Film: Mapping Conductivity by Conducting Atomic Force Microscopy

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Conducting Atomic Force microscopy (C-AFM) has been used to map the local conductivity of mono- or few-layer graphene grown on polycrystalline Ni thin films on SiO_2/Si substrate. It has been revealed that the local conductivity of graphene depend strongly on the crystal face of underlying Ni crystal. There exists a transition zone between the two adjacent surfaces, where the graphene has unique conductivity properties. Using C-AFM, combining with analysis of the graphene/Ni moiré pattern, we also characterize the graphene morphologies underneath the top graphene sheets, which provide clear evidence for CVD growth of graphene on Ni occurring by carbon segregation. Our findings are important for understanding both the physical properties of graphene sheets and their growth mechanism.

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References

[1] P. Sutter, J. T. Sadowski, and E. Sutter, Physical Review B, **80**(2009)245411.

[2] D. Usachov, A. M. Dobrotvorskii, A. Varykhalov, O. Rader, W. Gudat, A. M. Shikin, and V. K. Adamchuk, Physical Review B, **78**(2008)085403.

[3]D. Yu. Usachov, A. M. Dobrotvorskii, A. M. Shikin, V. K. Adamchuk, A. Yu. Varykhalov, O. Rader and W. Gudat, Bulletin of the Russian Academy of Sciences: Physics, **73**(2009)679.

[4] X. S. Li, W. W. Cai, L. G. Colombo, and R. S. Ruoff, Nano Letters., **9**(2009**)**4268

Figures

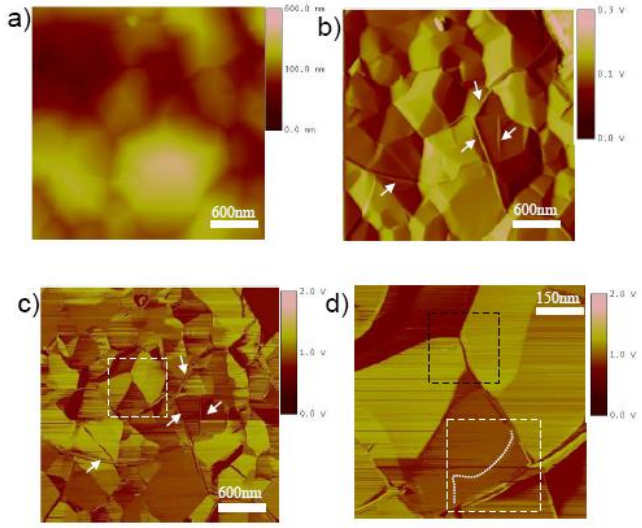

Figure caption

Local conductance maps on the three dimensional Ni crystals:
(a) Lager scale of topography of the graphene on Ni crystals;
(b) Deflection image of the topography;
(c) The conductance map composed of many flat patchs with various contrasts corresponding to different facets of the Ni crystals;
(d) The magnified region indicated by the white box in Figure 2c