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Visualizing the Fast Growth of Large Single-Crystalline Graphene

Chemical vapor deposition (CVD) technique has been demonstrated to be promising in growing large-area and high-quality graphene. However, the CVD-grown graphene is usually polycrystalline, which would degrade the electronic and mechanical properties. Consequently, to decrease the density of grain boundary, large single-crystalline graphene (LSCG) is synthesized via low supply of carbon source, which unfortunately exhibits low growth rate. Thus, fast growth of LSCG is an urging problem to realize the industrial growth of graphene film with high quality, which requires the in-depth understanding of the growth dynamics. Herein, we visualized the entire growth process of LSCG by using carbon isotopic pulse-labelling technique in conjunction with the Raman identification. The investigation of growth dynamics unveils the roles of carbon source in controllable growth of LSCG. By carefully tuning the carbon source supply, centimeter-sized graphene single crystals with high growth rate are realized.

References

Figures

[1] Sun, L.; Lin, L.; Zhang, J.; Wang, H.; Peng, H.; Liu, Z. Nano Res. 10 (2016) 355-363

[2] Lin, L.; Sun, L. Z.; Zhang, J. C.; Sun, J. Y.; Koh, A. L.; Peng, H. L.; Liu, Z. F. Adv. Mater. 28 (2016) 4671-4677.

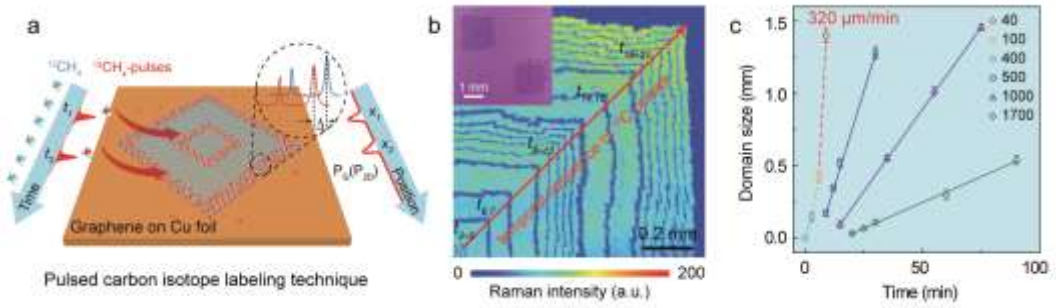

Figure 1: (a) schematic of visualizing fast growth of LSCG. (b) Optical image and Raman intensity maps of isotopic labeled LSCG. (c) Domain size as a function of growth time.