Single crystal graphene growth for Graphene Liquid Cell fabrication

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Graphene Liquid Cells (GLCs) offer a promising platform for LP-EM, due to the minimal loss of resolution caused by the atomically thin membrane and its radical scavenging properties. Currently multiple fabrication methods exist for GLC fabrication, most of which require support-free transfer of the top graphene layer. In our group loop-assisted transfer (LAT) of graphene is used, which is a process that produces intense mechanical stress on the support-free graphene. Therefore, the quality of the graphene is of the utmost importance for the GLC yield. Here we present our efforts to grow graphene with larger single crystalline domains, based on work by others, to obtain high-quality graphene for more efficient GLC fabrication. The basis of this procedure is to anneal a pre-oxidized copper substrate, to cause surface rearrangements and to have oxygen present during growth. The oxygen will reduce the amount of nucleation sites, leading to larger single crystalline domains. This approach has yielded larger domains, but is still being optimized to obtain the desired mm-cm sized single crystal graphene.

References

[1] M. Textor, N. de Jonge., *Nano Letters*, **18**(6): 3313-3321 (2018)
[2] Y. Wang, Y. Cheng, Y. Wang, S. Zhang, et al., *RSC Advances*, **8**(16): 8800-8804 (2018)
[3] Y. Hao, M.S. Bharathi, L. Wang, Y. Liu, et al., *Science*, **342**(6159): 720 (2013)
[4] C. Jia, J. Jiang, L. Gan, X. Guo., *Scientific Reports*, **2**(1): 707 (2012)

Figures

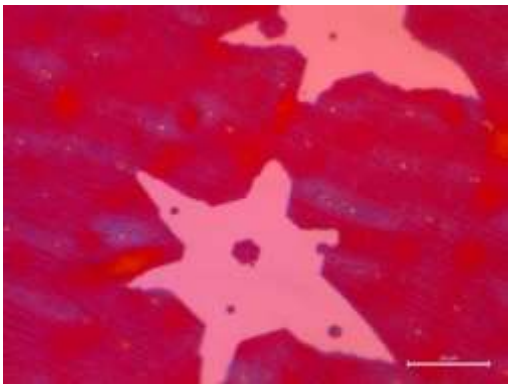

Figure 1. *Graphene flake obtained using reduced methane flow and increased growth temperature*