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Rapid Growth of Large Single-Crystalline Graphene with Ethane

Many studies are conducted based on large single-crystalline graphene for its promising application prospects. Contemporary growth conditions of large domain size graphene not only requiring a fastidious condition, but also suffering from a slow growth^[1, 2]. Thus, it led to a high energy consumption in large-scale production. Herein, we report a rapid growth method of large single-crystalline graphene using ethane as carbon feedstock. Experimental results have shown ethane as a carbon source could trigger the growth of high-quality graphene 4 times faster than using methane. Sub-centimeter single-crystalline graphene at 1000 °C by using ethane was achieved, with a remarkable growth rate 420 $\mu\text{m min}^{-1}$. In addition, for rapid growth of large single-crystalline graphene we proposed a method by making good use of thermal decomposition of carbon source which has lower decomposition energy barrier.

References

- [1] Han, G. H.; Gunes, F.; Bae, J. J.; Kim, E. S.; Nano Lett. 11 (2011), 4144.
- [2] Zhou, H.; Yu, W. J.; Liu, L.; Cheng, R.; Nat. Commun. 4 (2013), 2096.

Figures

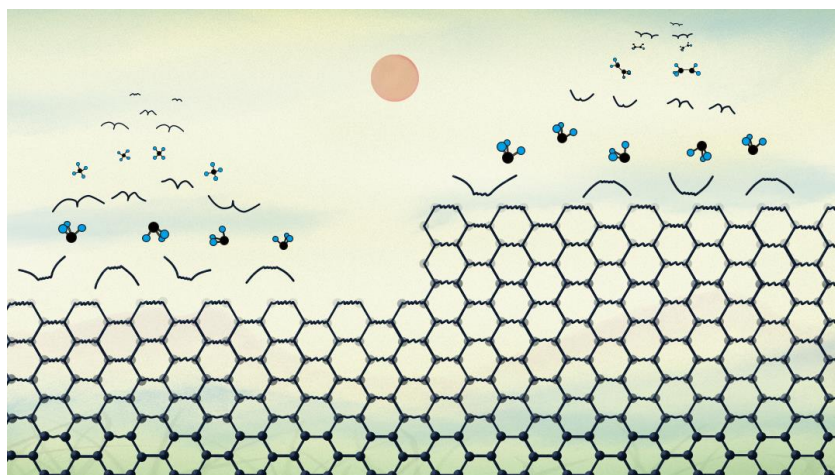


Figure 1: Comparison of graphene growth with methane (left) and ethane (right).