

2D material transfer methods used for microelectronic applications

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2D materials have attracted a lot of attention since the last decade do to their unique properties especially in the microelectronics field [1]. However, the thermal budgets used for the synthesis and the one for the application are, most of the time, not compatible and a transfer is usually required from the growth substrate to a desired one. We compare here two different methods set up in the CEA-LETI, called wet method [2] and dry method [3]. The wet method consists to deep into liquid the sample and use the capillary force to delaminate the 2D from the substrate and then collect with the required substrate the 2D material on top of the liquid. The dry method is compatible with cleaning room and microelectronics consists to deposit on top of the 2D a metallic strained thin film, basically Nickel film and then, thanks to a mechanical force and adhesion energy, delaminate the layer. The obtained film is deposit on a Silicon wafer before the etching of the Ni. Depending on the application developed, both methods present advantages and drawbacks and has to be employed with care.

References

- [1] Yuan Liu, Xidong Duan, Hyeon-Jin Shin, Seongjun Park, Yu Huang & Xiangfeng Duan, Nature | Vol 591 | 4 March 2021
- [2] Xuezhi Ma, Qiushi Liu, Da Xu, Yangzhi Zhu, Sanggon Kim, Yongtao Cui, Lanlan Zhong and Ming Liu, Nano Lett. 2017, 17, 6961-6967
- [3] Shim et al., Science 362, (2018) 665-670

Figures

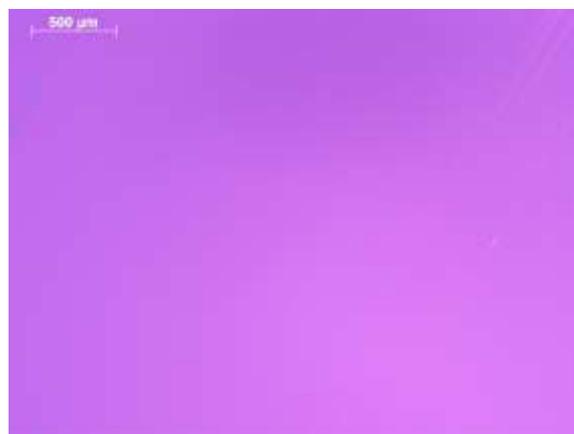


Figure 1: Transferred Aixtron's graphene from sapphire (growth) to SiO₂ (use).