Hui_ming Cheng
Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences, Shenyang 110016, China
Tsinghua-Berkeley Shenzhen Institute, Tsinghua University, Shenzhen 518055, China

Growth of High-Quality Graphene and Other 2D Materials By CVD

Graphene has brought a great deal of excitement to nanoscience community with its attractive and unique properties. Such excellent characteristics have triggered highly active researches on other 2D materials. These emerging 2D materials are promising candidates for flexible and transparent electronics. Furthermore, new physics observed in 2D materials allow for development of new-concept devices by using their valleys, tunneling effect, photoluminescence, and optical responsivity. Recently, vdWHs have been achieved by putting these 2D materials onto another, in the similar way to build Lego blocks. This enables us to investigate intrinsic physical properties of atomically-sharp heterostructure interfaces and fabricate high performance optoelectronic devices for advanced applications. In this talk, I will briefly introduce critical issues to be resolved for practical applications of 2D materials, including contact resistance, environmental sensitivity, coupling at interfaces, and surface modification.[1-3] Recently, we have shown how to solve these problems to improve the device performance of 2D materials. Further, we demonstrated high performance electronic devices consisting of vdWHs, such as transistors, memories, strain sensors, and solar cells.[4-8] Our approaches would allow us to come closer to practical applications of 2D materials in industry.

References

1. RenW. C. & ChengH. M., The global growth of graphene, *Nature Nanotechnology* **2014**, 9, 726-730.
2. GaoL. B., *et al*, Repeated growth and bubbling transfer of graphene with millimetre-size single-crystal grains using platinum, *Nature Communications* **2012,** 3, 699.
3. MaT., *et al*, Edge-controlled growth and kinetics of single-crystal graphene domains by chemical vapor deposition, *PNAS***2013**, 110 (51), 20386-2039.
4. GaoL. B., *et al*, Efficient growth of high-quality graphene films on Cu foils by ambient pressure chemical vapor deposition, *Applied Physics Letters***2010**, 97 (18), 183109.
5. ChenZ. P.,*et al*, Three-dimensional flexible and conductive interconnected graphene networks grown by chemical vapour deposition, *Nature Mater***2011**, 10 (6), 424-428.
6. GaoY., *et al*, Large-area synthesis of high-quality and uniform monolayer WS_2 on reusable Au foils, *Nature Communications***2015**, 6, 8569.
7. XuC., *et al*, Large-area high-quality 2D ultrathin Mo_2C superconducting crystals, *Nature Materials***2015**, 14 (11), 1135-1141.
8. Zhang Z. K., *et al*, Rosin-enabled ultraclean and damage-free transfer of graphene for large-area flexible organic light-emitting diodes, *Nature Communications* **2017,** 8:14560, DOI: 10.1038/ncomms14560.
9. MaT., *et al*, Tailoring the thermal and electrical transportproperties of graphene films by grain sizeengineering, *Nature Communications* **2017,** 8:14486, DOI: 10.1038/ncomms14486.