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Education:

- **B. S. (1993)**, Department of Physics, Huazhong University of Science and Technology, China
- **M.S. (1996),** Department of Physics, Fudan University, China
- **Ph.D. (2002),** Department of Physics, Nanjing University, China

Professional Affiliations:

- 1996-1999, Assistant Professor, Department of Physics, Qufu Normal University, China
- 2002-2003, Associate Professor, Department of Physics, Qufu Normal University, China
- 2009-2013, Assistant Professor, Institute of Textile and Clothing, Hong Kong Polytechnic University, Hong Kong S.A.R., China
- 2013-2016, Associate Professor, Institute of Textile and Clothing, Hong Kong Polytechnic University, Hong Kong S.A.R, China
- 2017-now, **Group Leader**, the Centre for Multidimensional Carbon Materials, Institute for basic Science (IBS-CMCM) & **Distinguished Professor**, Department of Material Science and Engineering, UNIST, Korea

Other Academic/Industrial Experience:

- 2003-2005, **Postdoctoral Researcher**, Chalmers University of Technology and Gothenburg University, Gothenburg, Sweden
- 2005-2009, **Research Scientist,** Rice University, Houston, USA

Research Interests

- Methods and algorithms development for material modelling and simulation.
- The formation mechanism of carbon materials, from fullerene to carbon nanotube and graphene.
- Kinetics and thermodynamics of materials growth and etching.
- The structure, properties and fundamentals of nanomaterials.
- The experimental synthesis of carbon nanotubes and low dimensional materials.

Researches Topics of the Theory Group in CMCM

To achieve a deep understanding on carbon and low dimensional materials for their synthesis and applications.

Carbon allotropies

The orbitals of a carbon atom, in a material, can be sp, sp^2 or sp^3 hybridized and therefore carbon materials exist in various forms, such as carbon vapor, liquid carbon, amorphous carbon, various sp2 allotropies (including fullerene, carbon nanotubes, graphene and graphite) and diamond, in nature. The studies of allotropies in molecular and crystalline forms were extensive but those understanding on irregular forms are relatively rare. So, we shall dedicate great efforts on the exploration of **carbon vapor, liquid carbon and amorphous carbon** to understand the fundamentals of carbon materials deeply.

Methods and algorithms development

With the fast progresses of computer hardware and software, we can simulate systems in larger and larger scale. So far, the highly accurate potential energy surfaces (PESs) and cost-efficient algorithms are two bottlenecks in material simulation. The development of new PESs of carbon and related materials and the algorithms that allow us to simulate a larger system faster and more accurately is another main research topic of us.

Theory of carbon nanotube and graphene growth

Carbon nanotubes and graphene two star materials today are expected to have huge impact on human's life in the future. Although the experimental studies are already very extensive, the theoretical understanding on the mechanism of their synthesis is very limited. Based on our previous experiences, we shall keep dedicating great efforts on it until a complete picture on their synthesis is clear.

Theory of materials etching

The theory of crystal growth is well established although its applications in nanoscale materials require some modifications. In contrast, the theory and our understanding on materials etching is very rare although it is very important for material processing in modern industry.

The theory of 2D material's growth

The synthesis of atomic-thin 2D materials in high quality cannot be considered as a self-templating process like the growth of 3D materials. Based on our previous understanding on graphene chemical vapor deposition growth, we will explore the basic sciences regarding the 2D materials synthesis on a substrate.

The experimental synthesis of carbon nanotubes and 2D materials

The controllable synthesis of carbon nanotubes (CNTs) in high-quality and large-scale is known as one of the most challenging research topics in nanomaterials. Guided by our theoretical study, we shall explore the fundamentals of CNT growth and seek potential means to achieve their structure control and large scale synthesis experimentally. Along with the theoretical study, some experimental studies on 2D materials synthesis shall be carried out.

Selected Publications:

See http://www.researcherid.com/rid/D-5938-2011 for the list of updated publications:

1. "*Chirality Controlled Growth of Horizontal Carbon Nanotubes Array with Designed Catalysts*", SX. Zhang, LX. Kang, X. Wang, LM. Tong, LW. Yang, ZQ. Wang, K. Qi, SB Deng, QW Li, XD Bai, **F. Ding** and J. Zhang, ***Nature*, 543, 234 (2017)**
2. "*Stacking sequence and interlayer coupling in few-layer graphene revealed by in situimaging*", ZJ. Wang, JC. Dong, Y. Cui, G. Eres, O. Timpe, Q. Fu, F. Ding, R. Schloegl, MG. Willinge, ***Nat. Comm.,*** 7, 13256 (**2016**)
3. "*Ultrafast Growth of Large Single-crystal Graphene Assisted by Continuous Oxygen Supply*" XZ Xu, ZH Zhang, L Qiu, JN Zhuang, L Zhang, H Wang, CN Liao, HD Song, RX Qiao, P Gao, ZH Hu, L Liao, ZM Liao, DP Yu, EG Wang, **F Ding**[*], HL Peng[*], KH Liu[*], ***Nat. Nano*, 11, 930 (2016)**
4. "*Chemical vapor deposition synthesis of near-zigzag single-walled carbon nanotubes with stable tube-catalyst interface*", 2, e1501729, QC Zhao, ZW Xu, Y. Hu, **F. Ding** ,J. Zhang, ***Science Advances*** 6, 6499, (**2016**)
5. "*Fast growth of inch-sized single-crystalline graphene from a controlled single nucleus on Cu–Ni alloys*", TR Wu, XF Zhang, QH Yuan, JC Xue, GY Lu, ZH Liu, HS Wang, HM Wang, **F Ding**, QK Yu, XM Xie, MH Jiang, *Nat. Mat.*, 15, 43-47 **(2016);**
6. "*Synthesis of large single-crystal hexagonal boron nitride grains on Cu-Ni alloy*", GY Lu, TR Wu, QH Yuan, HS Wang, HM Wang, **F Ding**, XM Xie, MH Jiang ***Nat. Comm.,*** 6, 6106, (**2015**)
7. "*Silane-catalysed fast growth of large single-crystalline graphene on hexagonal boron nitride*" SJ Tang, HM Wang, HS Wang, QJ Sun, XY Zhang, CX Cong, H Xie, XY Liu, XH Zhou, FQ Huang, XS Chen, T Yu, **F Ding**, XM Xie, MH Jiang, ***Nat. Comm.,*** 6, 6499, (**2015**)
8. "*Chirality-specific growth of single-walled carbon nanotubes on solid alloy catalysts*", F. Yang, X. Wang, DQ Zhang, J. Yang, D. Luo, ZW Xu, JK Wei, J.-Q. Wang, Z. Xu, F.Peng, XM Li, RM Li, YL Li , MH Li, XD Bai**, F. Ding**, Y. Li. ***Nature,*** 510, 522-524 (2014)
9. "*Helicity-dependent single-walled carbon nanotube alignment on graphite for helical angle and handedness recognition*", YB Chen; ZY Shen; ZW Xu; Y. Hu; HT. Xu; S. Wang; XL. Guo; YF. Zhang; LM. Peng; **F. Ding**; ZF. Liu; J. Zhang, ***Nature Comm.,*** 4, 2205 (2013)
10. "*Edge-controlled growth and kinetics of single-crystal graphene domains by chemical vapor deposition*", T. Ma, WC. Ren, XY. Zhang, ZL. Liu, Y. Gao, LC. Yin, XL M, **F. Ding**, and HM. Cheng, ***Proc. Nat. Acad. Sci. USA*** 110, 20386 (**2013**)
11. "*In situ observation of graphene sublimation and multi-layer edge reconstructions*",Huang, Jian Yu; **Ding, Feng**; Yakobson, Boris I.; Lu, Ping; Qi, Liang; Li, Ju ***Proc. Nat. Acad. Sci. USA*** 106, 10103 (**2009**)
12. *"Dislocation theory of chirality-controlled nanotube growth"*, **Ding Feng**; Harutyunyan Avetik R.; Yakobson Boris I. ***Proc. Nat. Acad. Sci. USA*** 106, 2506 (**2009**).
13. "*Efficient Defect Healing in Catalytic Carbon Nanotube Growth*", Yuan, Qinghong; Xu, Zhiping; Yakobson, Boris I and **Ding, Feng *Phys. Rev. Lett.*, 108, 245505(2012)**
14. "*Threshold Barrier of Carbon Nanotube Growth*", Qinghong Yuan, Hong Hu, and Feng Ding**, *Phys. Rev. Lett.*** 107, 156101 (**2011**)
15. "*Comment on "Mechanism for Superelongation of Carbon Nanotubes at High Temperatures""* **Ding, Feng**; Huang, Jianyu.; Yakobson Boris. I. ***Phys. Rev. Lett.*** 103, 039601 (2009)
16. *"Real time microscopy, kinetics, and mechanism of giant fullerene evaporation"*, Huang, Jianyu; **Ding, Feng**; Jiao, Kun; Yakobson, Boris I. ***Phys. Rev. Lett.*** 99, 175503 (**2007**).
17. *"Dislocation dynamics in multiwalled carbon nanotubes at high temperatures"*, Huang, Jianyu; **Ding, Feng**; Yakobson, Boris I.; ***Phys. Rev. Lett.*** 100, 035503 (**2008**).
18. "Edge-Controlled Growth and Etching of Two-Dimensional GaSe Monolayers", XF Li, JC Dong, JC. Idrobo, AA. Puretzky, CM. Rouleau, DB. Geohegan, **F. Ding**, and K. Xiao, **J. Am. Chem. Soc.,** 139, 482 **(2017)**
19. "*Role of Hydrogen in Graphene Chemical Vapor Deposition Growth on a Copper Surface*" XY. Zhang, L. Wang, B. I. Yakobson, J. Xin, **F. Ding**, ***J. Am. Chem. Soc.,*** 136, 3040 (**2014**)
20. "*Formation and Healing of Vacancies in Graphene Chemical Vapor Deposition (CVD) Growth*", Wang, Lu; Zhang, Xiuyun; Chan, Helen L. W.; Yan, Feng; **Ding, Feng**, ***J. Am. Chem. Soc.,*** 11, 4476-4482 (2013)
21. "*Magic Carbon Clusters in the Chemical Vapor Deposition Growth of Graphene*",Yuan, Qinghong; Gao, Junfeng; Shu, Haibo; Zhao, Jijun; Chen, Xiaoshuang and **Ding, Feng**. ***J. Am. Chem. Soc***. 134, 2970 (**2012)**

22. "*Transition Metal Surface Passivation Induced Graphene Edge Reconstruction*", Gao, Junfeng; Zhao and **Ding, Feng. *J. Am. Chem. Soc***. 134, 6204 (**2012**)
23. "*Graphene Nucleation on Transition Metal Surface: Structure Transformation and Role of the Metal Step Edge*", Gao, Junfeng; Yip, Joanne; Zhao, Jijun; Yakobson, Boris I.; **Ding, Feng, *J. Am. Chem. Soc***. 133, 5009 (**2011**)
24. "*Upright Standing Graphene Formation on Substrates*", Yuan, Qinghong; Hu, Hong; Gao, Junfeng; **Ding, Feng**; Liu, Zhifeng; Yakobson, B. I. ***J. Am. Chem. Soc.*** 133, 16072 (**2011**)
25. *"Low-temperature single-wall carbon nanotubes synthesis: Feedstock decomposition limited growth"*, Mora, Elena; Pigos, John M; **Ding, Feng**; Yakobson, Boris I.; Harutyunyan, Avetik R.; **J. Am. Chem. Soc**. 130, 11840 (**2008**).
26. "*Strain-Induced Orientation-Selective Cutting of Graphene into Graphene Nanoribbons on Oxidation*", Ma, Liang; Wang, Jinlan; **Ding, Feng**, ***Ang. Chem. Int. Ed***. 51, 1161 (**2012**)
27. "*Strain-Induced Orientation-Selective Cutting of Graphene into Graphene Nanoribbons on Oxidation*", Ma, Liang; Wang, Jinlan; **Ding, Feng**, ***Ang. Chem. Int. Ed***. 51, 1161 (**2012**)
28. "*How a zigzag nanotube grows*" QH Yuan, **Feng Ding**, ***Ang. Chem. Int. Ed.*** 54, 5924 (**2012**)
29. "*The Structure and Stability of Magic Carbon Clusters Observed in Graphene Chemical Vapor Deposition Growth on Ru(0001) and Rh(111) Surfaces* **",** JF Gao, **F. Ding, *Ang. Chem. Int. Ed.*** 53, 14031 (**2015**)
30. "*Two-Dimensional Layered Heterostructures Synthesized from Core–Shell Nanowires*", Q. Zhang, X. Xiao, RQ Zhao, DH Lv, GC Xu, ZX Lu, LF Sun, SZ Lin, X Gao, J Zhou, CH Jin, **F Ding**, and LY Jiao ***Ang. Chem. Int. Ed***. 54, DOI: 10.1002/anie.201502461 (**2015**)

Openings in the Theory Group at CMCM

The theory group has 3-4 openings for Research Fellow positions and 5-6 openings for PhD Students in the following research topics:

i. Multi-scale computational methods development for materials science
ii. Application of machine learning in materials science
iii. The growth mechanism of low dimensional materials
iv. The structural defects, mechanical, thermal, electronic properties of CNTs, graphene and 2D materials
v. Experimental synthesis of carbon nanotubes and other 2D materials

Interested candidates should send to f.ding@unist.ac.kr an updated CV for further consideration.