

HK Institute of
Quantum Science & Technology
香港量子研究院

Controlling Atomic Placement in Nanomanufacturing (onsite and online)

Seminar jointly organized by the Department of Mechanical Engineering and the HK Institute of Quantum Science and Technology

Date: 22 November, 2023 (Wednesday)
Time: 2:00 p.m. (Hong Kong Time)
Venue: Tam Wing Fan Innovation Wing Two
G/F, Run Run Shaw Building, HKU

Speaker: Prof. Rong Chen
School of Mechanical Science and Engineering
Huazhong University of Science and Technology (HUST)
China



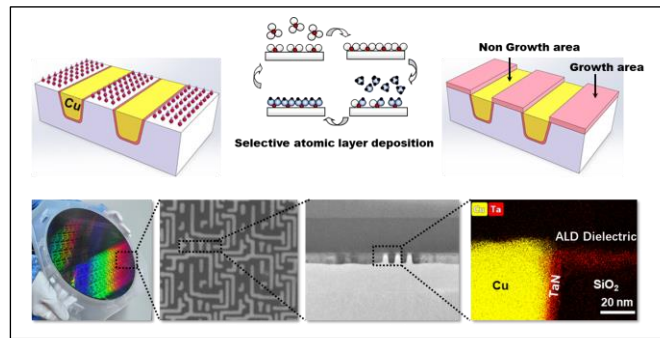
Zoom Online Lecture:

Meeting ID: 923 6189 8401
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Abstract:

Nanomanufacturing has aroused rising research interest due to the various applications in electronics, catalysts, and batteries, and nanofabrication methods for fabricating materials with atomic-level control are becoming increasingly important. Atomic layer deposition (ALD) is a vapor-based method that provides excellent capabilities for depositing ultrathin solid films, nanoparticles and other nanoscale materials. Based on sequential, self-limiting vapor-surface reactions, ALD has become a popular nanofabrication tool because it provides exceptional conformality, thickness control at the angstrom level, and high-quality pinhole free films.[1] In this talk, I will discuss the chemical principal and mechanisms that enable selective atomic layer deposition, which is gaining rapidly growing interest and has unlocked attractive avenues for the development of novel nanostructures by depositing atoms at desired surface locations.[2] It has found versatile applications in semiconductor industry and beyond.[3] I will also show that atomic level processes enabled functional layers and encapsulation techniques. Various applications ranging from flexible displays to energetic materials in power batteries will be discussed. [4] For future nanomanufacturing, ALD is still evolving to expand its abilities as an enabling technique, providing a window of opportunity for large scale atoms integration.



References:

- [1] R. Chen,* Y. Li, J. Cai, K. Cao, H. Lee “Atomic level deposition to extend Moore’s law and beyond”, *International Journal of Extreme Manufacturing* 2020, 2, 022002.
- [2] Y. Li, Y. Lan, K. Cao,* J. Zhang, Y. Wen, B. Shan, R. Chen * “Surface Acidity-Induced Inherently Selective Atomic Layer Deposition of Tantalum Oxide on Dielectrics” , *Chemistry of Materials* 2022, 34, 913.
- [3] Y. Li, Z. Qi, Y. Lan, K. Cao, * Y. Wen, J. Zhang, Y. Gu, J. Long, J. Yan, B. Shan, R. Chen * “Self-aligned patterning of tantalum oxide on Cu/SiO₂ through redox-coupled inherently selective atomic layer deposition”, *Nature Communications* 2023, 14:4493.
- [4] K. Cao, J. Cai, B. Shan, R. Chen * “Surface functionalization on nanoparticles via atomic layer deposition”, *Science Bulletin*, 2020, 65, 678.

Biography:

Professor Chen is a full professor at Huazhong University of Science and Technology (HUST) with the School of Mechanical Science and Engineering, by courtesy of School of integrated circuits, optical and electronic information, China-EU Institute for clean and renewable energy of HUST, and college of future technologies.

Prof. Chen received her bachelor of science from University of Science and Technology of China (USTC), M. Sc. and Ph.D. degrees from Stanford university. Afterwards, she was a senior researcher in Applied Materials, Inc. and Intel Labs before she joined HUST.

Prof. Chen is the PI for several national grants, including the key project of national natural science foundation of China, National Key R&D Program of China, National Basic Research Program of China, Innovation team leader of Hubei Province, etc. Her research focuses on atomic level manufacturing, by understanding surface science, and applying this knowledge to a range of problems in sustainable energy, semiconductor processing, and nanotechnology. Prof. Chen has authored and co-authored over 200 peer-reviewed journal articles and dozens of conference proceedings, has published three books and two book chapters. Prof. Chen has been granted over 100 issued Chinese invention patents and more than 10 international patents. She is the convener for ISO TC107 WG5- atomic layer deposition.

Prof. Chen is the recipient of many prestigious national and international awards, including National Innovation Leading Talents, 3rd Tencent Xplore award, 17th Science & Technology Award for Young Talents, 25th Qiushi Outstanding Youth Transformation Award of China Association for Science and Technology, Distinguished young investigator of China frontiers of engineer, the first prize of technical invention in Hubei Province, the Hubei Province Intellectual

property award, Winner of the National Disruptive Technology Innovation Competition, Science and Technology Innovation China - Leading Technology award, IEEE SMC Distinguished Academic Contribution Award, the special gold prize (with the congratulations of the jury) of Geneva International Inventions, the Simon Karecki award of Semiconductor Research Association, the Texas Instruments Woman's Fellowship for Leadership in Microelectronics, etc.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. Nicholas Fang at 3917 2639.