北京大学量子材料科学中心

International Center for Quantum Materials, PKU

量子物质名家讲堂

Quantum Matter Distinguished Lecture Series

The beauty and value of atomically resolved imaging of surfaces

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奥地利科学院副院长

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时间：2026年4月27日（周一）上午10:00

Venue: Room w301, Physics building, Peking University

地点：北京大学物理楼，物理学院西301思源报告厅

Abstract

Shortly after the invention of the Scanning Tunneling Microscope, which was awarded the Nobel Prize in Physics in 1986 and spawned the 'nanorevolution', atomic force microscopy (AFM) became available. AFM has proven its usefulness as a rugged, versatile tool in science and engineering. Interestingly, atomically resolved surface imaging took off much later and was accelerated by the invention of the qPlus sensor [1]. In the talk, I give a short overview of the elegance and usefulness of non-contact AFM results. Predominantly used for imaging flat organic molecules [2], it is invaluable for the on-surface synthesis of carbon-based nanostructures [3]. Its non-invasive nature makes it a perfect tool for investigating the structural intricacies of adsorbed water [4] or for assessing the acidity of single surface hydroxyls [5]. In recent work, we have applied non-contact AFM to insulating materials, which enabled us to resolve several long-standing enigmas. The bulk-terminated surface of Al_2O_3(0001) was expected to be highly reactive toward water, but experiments do not support this prediction. ncAFM images showed that the surface is only partially ordered [6]. Upon heating, it undergoes a massive reconstruction, and the exact atomic structure has now been resolved [7]. And for AgI(0001) [8], a perfect lattice match with hexagonal ice would make the material an ideal ice nucleator, but its surface polarity necessitates reconstructions that could destroy this beneficial relationship.

[1] F.J. Giessibl, Rev. Sci. Instr. 90 (2019) 011101
[2] L. Gross, et al. Science 325 (2019) 1110
[3] J. Cai, et al. Nature 466 (2010) 470
[4] J. Hong, et al., Nature 630 (2024) 375
[5] M. Wagner et al. Nature 592 (2021) 722
[6] J.I. Hütner-Reisch et al., submitted
[7] J. I. Hütner, et al., Science 385 (2024) 1241
[8] J. I. Hütner, et al., Sci. Advances 11, 44 (2025) eaea2378

About the speaker

Ulrike Diebold教授现任维也纳工业大学物理系教授。她于1990年在该校获得博士学位，随后赴美国开展了长达20年的学术研究工作，先在罗格斯大学从事博士后研究，继而在杜兰大学任教，历任助理教授、副教授及教授。2010年，她返回母校，担任应用物理研究所所长。自2022年起，她出任奥地利科学院副院长。她曾荣获多项重要学术奖项，包括两项欧洲研究委员会高级资助以及奥地利最高科研荣誉——维特根斯坦奖。她是美国真空学会、美国物理学会、美国科学促进会及英国皇家化学学会会士，同时当选奥地利科学院、德国国家科学院、欧洲科学院、欧洲人文与自然科学院及美国艺术与科学院院士。

Diebold教授长期从事实验表面物理研究，重点聚焦金属氧化物体系的原子尺度研究。迄今已发表同行评议论文300余篇，受邀作学术报告400余场（包括多次大会主旨报告），其研究成果累计被引用超过44,000次，H指数达96。她还担任《Science》审稿编委会成员及多家学术期刊编委，并在多个国际学术顾问委员会任职。此外，她还是奥地利科学基金资助的SFB TACO合作研究中心首席研究员，以及"材料能源转换"卓越集群董事会成员。