



Seminar

Atomic force microscopy in organic solvents

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Time: 4:00 pm, Jan. 23, 2024(Tuesday)

时间: 2024年1月23日 (周二) 下午4:00

Venue: Room w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

Frequency-modulation atomic force microscopy (FM-AFM) provides a promising tool for observing solid topography and liquid structure at liquid-solid interfaces. The cantilever with a tip is mechanically oscillated. The shift of the resonance frequency, Df , represents the force pushing or pulling the tip. Microscopes with a force sensitivity of 10 pN or better in liquid have been developed and even commercialized. Using these advanced microscopes, we have studied a variety of interfaces including CaCO_3 [1], SrTiO_3 [2], TiO_2 [3], salicylic acid, sucrose [4], graphite [5], and polypropylene films [6] immersed in water or organic solvents. We are currently focused on ice films immersed in organic solvents. For example, when ice is in contact with liquid 1-hexanol ($\text{C}_6\text{H}_{13}\text{OH}$), the hexanol-ice interface is fixed in space at temperatures below the freezing point of ice (0°C) and above the freezing point of hexanol (-44°C). Another current topic is the application to liquid lubricants [7]; low-vapor-pressure hydrocarbons modified with a small amount of polar organic compounds. The polar modifiers are adsorbed onto the surface of the sliding solids to form monomolecular layers to minimize adhesion across the sliding interface. These AFM-based research activities will be reviewed in the talk.

[1] Imada et al., *Langmuir* **2013**, 29, 10744–10751.

[2] Kawasaki et al., *Journal of Physical Chemistry C* **2017**, 121, 2268–2275.

[3] Xue et al., *Journal of Chemical Physics* **2020**, 152, 054703 (7 pages).

[4] Teduka et al., *ACS Omega* **2020**, 5, 2569–2574.

[5] Hiasa et al., *Journal of Physical Chemistry C* **2012**, 116, 26475–26479.

[6] Uchida et al., *Polymer* **2016**, 82, 349–355.

[7] Moriguchi et al., *ACS Omega* **2019**, 4, 17593–17599.

About the speaker

Hiroshi Onishi, 神戸大学化学系教授。1993年于东京大学获得博士学位。1989年至1999年先后在东京大学担任助理教授，教授。1999年至2004年在神奈川科学技术研究院担任研究组长。2004年至今在神戸大学担任教授。主要研究方向为用调频原子力显微镜（FM-AFM）观察固液界面的固体形貌和液体结构。目前的研究兴趣包括浸泡在有机溶液中的冰层和液体润滑剂的应用等。在相关领域发表研究论文189篇和综述18篇，相关引用达到10600余次。