



Seminar

Studying surface structure and ultra-fast surface dynamics using magnetically manipulated atomic and molecular beams

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Time: 10:00am, March. 7, 2016 (Monday)

时间: 2016年3月7日 (周一)上午10:00

Venue: Room W563, Physics Building, Peking University

地点: 北京大学物理学院, 西楼563会议室

Abstract

In our group we use magnetically manipulated beams of atoms and molecules for studying surface structure and dynamics. One technique we use is called helium spin echo spectroscopy, the setup is essentially a time resolved atom interferometer, which is capable of measuring atomic scale motion which takes place on a time scale of pico to nanoseconds[1], a range which is inaccessible using conventional surface science techniques. I will explain the basic principles of the technique and the experimental apparatus, and present as an example a recent study where we used this apparatus to study the fast and highly correlated diffusive motion of sodium atoms on a nano-structured surface[2]. Using molecular dynamics simulations for the interpretation of the data, we extract the energy barrier for diffusion, a lower limit for the Schwoebel barrier and also observe a non-isotropic repulsive interaction between the Na atoms which is attributed to a screening effect of the atomic step[2]. A second different research project, I will briefly describe, is an attempt to use nuclear magnetic resonance (NMR) to study surface structure and dynamics. NMR is a particularly sensitive technique which is often used to determine atomic-scale structure and dynamics in the bulk, however, it is hardly used in surface science due to its low detection sensitivity. We have demonstrated that a high purity ortho-H₂O beam can be obtained using simple magnetic manipulations[3-4]. I will describe our ongoing attempts to use this molecular beam to grow thin ice films which are ~ 100% spin polarised and perform the first NMR experiments from a deposited monolayer of hyper-polarized water molecules.

[1] Science. 304, 1790 (2004)

[2] Journal of Physical Chemistry Letters., 2015, 6, 4165 (2015).

[3] Science, 331, 319 (2011)

[4] Physical Review A, 86, 062710 (2012)

About the Speaker

Prof. Gil Alexandrowicz got his Ph.D. in Physics from Cavendish Laboratory, University of Cambridge in 2005, and then did postdoc there for three years. Now he works in Israel Institute of Technology as an Associate professor. His research focuses on structure and ultra fast dynamics on surfaces, helium atom scattering, and nano-scale friction on surfaces & magnetically manipulated atomic and molecular beams.