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Probing Surfaces and Interfaces of Solid Materials with Linear and Nonlinear Optical Techniques

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地点：北京大学物理大楼中212教室

•**摘要：** Surfaces and interfaces of solid materials that consist of only a few atomic or molecular layers are a unique class of materials by themselves. Understanding properties of surfaces and interfaces is crucial from a number of standpoints. All forms of material synthesis and processing start at a solid surface, they are thus controlled by atomistic and molecular processes that occur at the surface. As physical dimensions of building blocks of solid-state devices continue to decrease down to a few nanometers, properties of the devices made of these nano-materials are significantly influenced by structural, electronic and transport properties of the surface that are distinct from those of the bulk. This is because the surface possesses different symmetries as required by its distinct physical setting. Furthermore, an interface separating two materials often hosts localized states with properties not found in either of the bulk materials such as classical surface plasmon polaritons in the vicinity of a metal surface, surface states on a topological insulator (driven by abrupt change in topological order parameter), and conducting states at the interface between polar and non-polar insulators (driven by polarization catastrophe). Measuring various properties of a solid surface by analyzing rich information in light reflection from the solid has many advantages such as non-invasiveness, in-situ detection (seeing it as it happens), access to deeply buried interfaces, being immune to volatile material synthesis and processing environments such as under high pressures and in liquid. Yet optical reflection from a solid surface contains an overwhelmingly large contribution from the bulk of the solid that needs to be suppressed. In this presentation, I show how one can characterize a solid surface or an interface with light reflection by taking advantage of various symmetry-breaking effects that dramatically reduces the contribution from the bulk. The symmetries include point-group symmetry, translational symmetry, time-reversal symmetry, and even s/p-polarization symmetry.

•**报告人简介：朱湘东，** 加州大学戴维斯分校物理系教授。1982年本科毕业于北京大学物理系。1981年入加州大学伯克利分校攻读实验凝聚态物理。1989年获物理博士。同年受聘于加州大学戴维斯分校物理系做助教授。1993年升副教授。1998年升正教授。2001年起任中科院物理所光学实验室客座教授。2018起任复旦大学信息学院讲座教授（为期三年）。2007年选入美国物理学会会士（Fellow of American Physical Society）。2011年选入美国光学学会会士（Fellow of Optical Society of America）。多年从事表面物理和光学物理方面的工作。从2000年开始生物物理方面的工作。主要发明了一种特殊的椭偏测量方法（光反射差法）并以此为基础开发了一个高通量，无标记的生物化学反应测量平台。此平台被用于分子生物物理和生物化学方面的基本研究和小分子及生物医药开发。最近两年发明了斜入射Sagnac光干射方法，并开始用这个实验方法研究非常态固体材料包括拓扑绝缘体里表征固体相的磁特征磁和微磁测量。

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