表面力仪可以直接测量表面（无机，有机，金属，氧化物，聚合物，玻璃，生物等）之间，在分子水平上研究界面和薄膜现象的静态和动态力。模块化设计与众多附件可供选择和定制扩展升级（见第3页）。

The SFA 2000 Basic Unit with optics stand - *designed by Jacob Israelachvili*

应用范围

研究领域以及可测的相互作用力 *

- 分散科学 – 存在于液体表面和蒸汽的“胶体”力
- 附着力科学 – 远程胶体力和短程粘附力
- 表面化学 – 不同材料之间的表面和电化学互动
- 清洁,食品研究 – 表面活性剂与脂质单层和双层之间的作用力
- 生物材料和生物表面 – 蛋白质和经聚合物涂布表面之间的力
- 生物医药相互作用 – 配体和受体、蛋白质和生物膜之间的相互作用
- 摩擦学 – 摩擦，润滑和光滑或粗糙的表面磨损，薄膜流变
- 粉末科技 – 互动作用过程中毛细效应和表面变形
- 材料研究 – 金属和氧化物表面和薄膜的机械性能以及失效分析

* 研究范围不局限于这个清单，如有其它需求请联系我们。

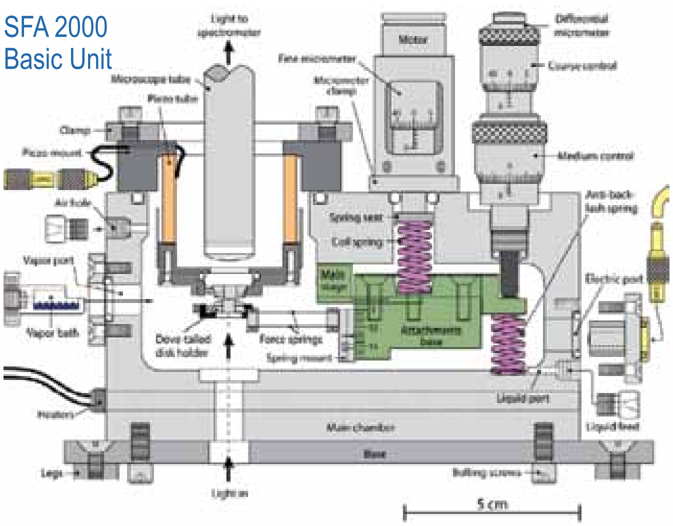
仪器概况

表面力仪测试的是存在于气体或液体中的两个光滑表面之间的力。灵敏度在纳牛级别，距离分辨率为0.1纳米。它可以测量表面上的吸附等温线，毛细管冷凝。表面力学方面，可以测试动态相互作用力，如粘弹性和摩擦力以及薄膜流变性，并可以观察分子（纳米）级别上表面变形之间介质折射率的实时变化。一些达到分子级平整度以及以上的硬材料都　作　基　的光滑表面材料，比如云母，二氧化硅，蓝宝石，聚合物;这些基　也可使用表面活性剂、脂质、聚合物、金属、金属氧化物、蛋白质和其它生物分子等进行　。

工作原理

下图是SFA2000的示意图。相互作用的形状表面，它们之间的绝对分离，吸附层表面的厚度通过白光干涉仪（精度0.1纳米范围内）分析光学干涉条纹来获得。表面之间的距离是通过从毫米到埃级精度的四阶控制。该测力弹簧的刚度可以在实验过程中进行调整，以适应测量各种不同大小的力。动态测量在运动表面进行（垂直，水平，或在三维空间中的任何方向），可以通过使用以下各页中描述的附件来实现。

SFA 2000
Basic Unit



SFA Contorl Box

USES

The SFA technique is routinely used to characterize and quantify various types of interactions between surfaces in liquids and vapors (see references on page 4). Static interactions include van der Waals and electrostatic forces, forces due to solvent structure (solvation and hydration forces), capillary forces, hydrophobic interactions, polymer-mediated steric and depletion forces, surfactant monolayers and lipid bilayers, adhesion and bio-specific “lock-and-key” type binding interactions. Dynamic and time-dependent interactions include the viscosity of liquids in ultra-thin films (nano-rheology), slow relaxations of liquids, and polymers in confined geometries, and surface deformations during the approach, separation and lateral sliding of two surfaces. More recent applications have included food technology, the friction of clutches, how geckos run on walls and ceilings, the bioadhesion of mussels, and the biolubrication of joints.

SFA 2000

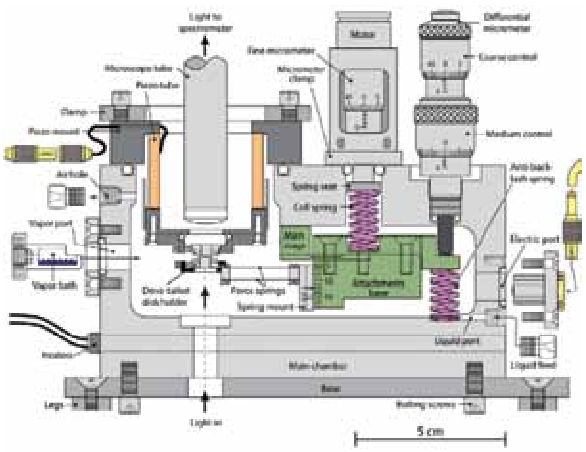
SurForce LLC

MAIN FEATURES AND ATTACHMENTS

For anyone who wants to accurately measure the forces or any type of “interaction” between two material surfaces at any given separation in air, vapor or liquid, including their local geometry (shape) and deformations, the SFA 2000 stands unrivalled as to directness of measurement and visualization, unambiguous (sub-ångstrom) accuracy, and stability to thermal drift. Unlike some surface force-measuring instruments, such as scanning probe microscopes and pin-on-disk tribometers, the SFA 2000, especially when used with FECO optics, measures forces between surfaces at precisely known surface separations, providing the local surface geometry (shape), directly at the point of interaction. A number of facilities that appeared as accessories in earlier models (such as the SFA 3) are now part of the SFA 2000, and new attachments allow for various dynamic measurements to be made, for example, of friction, lubrication and viscoelastic forces over a large range of speeds or shear rates. Four of these new facilities are illustrated below:

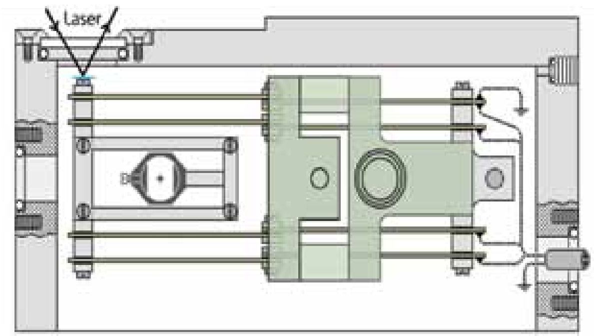
FRICTION DEVICE ASSEMBLY

For friction and lubrication studies



PIEZOELECTRIC BIMORPH SLIDER

For high-speed shearing of thin films



BIMORPH VIBRATOR

For measuring thin-film viscosity

UNDER-WATER MOUNTS

For biological (e.g., protein) surfaces

OTHER CUSTOMIZED ATTACHMENTS INCLUDE:

(1) Variable stiffness force-measuring spring. (2) Constant force-measuring balance (patented). (3) Attachments for moving and detecting forces in 3D (patented). (4) High-speed friction attachment (pin-ondisk type). (5) Attachments for applying electric or magnetic fields. (6) In situ fluorescence & FRAP measurements (FL-SFA). (7) Attachment for electrochemical studies (the EC-SFA).

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