

AUSTRALIAN JOURNAL OF CHEMISTRY

AN INTERNATIONAL JOURNAL FOR CHEMICAL SCIENCE

RESEARCH FRONT: Scanning Probe Microscopies

Essay

A Forecast of Developments in Scanned Probe Microscopy

Vincent S. J. Craig, Tim J. Senden

Aust. J. Chem. **2006**, *59*, 355–358.

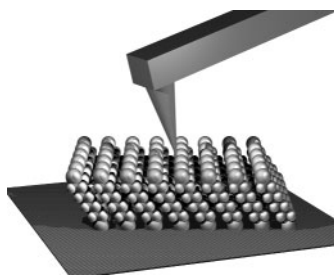
Since their introduction 25 years ago Scanned Probe Microscopies (SPM) have revolutionized surface studies. Here we attempt to forecast developments in SPM techniques and instrumentation beyond those that will be immediately upon us. The possible developments are powerful and diverse, and will undoubtedly result in major advances in nanoscale analysis.

Review

Developments in Using Scanning Probe Microscopy To Study Molecules on Surfaces — From Thin Films and Single-Molecule Conductivity to Drug–Living Cell Interactions

*Pall Thordarson, Rob Atkin,
Wouter H. J. Kalle, Gregory G. Warr,
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Aust. J. Chem. **2006**, *59*, 359–375.



The invention of the scanning probe microscope, including the scanning tunnelling microscope (STM) and atomic force microscope (AFM), in the 1980s revolutionized our understanding of the properties and behaviour of molecules on surfaces. Recent developments in this area will be discussed in this review.

Rapid Communications

STM Investigation of Alkylated Thiotriphenylene Monolayers at the Solid–Liquid Interface: Structure and Dynamics

*Matteo Palma, Giuseppina Pace,
Olivier Roussel, Yves Geerts,
Paolo Samorì*

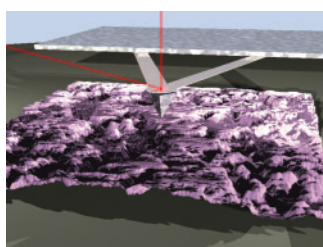
Aust. J. Chem. **2006**, *59*, 376–380.

Understanding and controlling the self-assembly of discotic conjugated molecules into highly ordered organic thin films, as well as their evolution towards equilibrium, is of importance for their possible application in opto-electronic devices. We describe an STM investigation of the structure and dynamics the title material at the solid–liquid interface. Focussing on Ostwald ripening phenomena and the nature of the STM contrast provide insight into the physical and chemical driving forces that control molecular assembly.

Growth of Double-Chained Cationic Surfactant Films on Mica

*Annabelle Blom, Gregory G. Warr,
Erica J. Wanless*

Aust. J. Chem. **2006**, *59*, 381–385.



Dialkyl (C_n) chained quaternary ammonium surfactants adsorb onto a mica surface at a rate ideal for AFM observation. Surfactant monolayers and bilayers are shown to grow through the nucleation, growth and coalescence of patches of different packing density.

Interaction Forces of a Supported DOPC Bilayer in the Presence of the General Anaesthetic Halothane — An Atomic Force Microscopy Study

Leanne G. Shamrakov,
Zoya V. Leonenko, Eric Finot,
David T. Cramb

Aust. J. Chem. **2006**, *59*, 386–389.

The effect of general anesthetics on the mechanical properties of lipid bilayers is largely unknown. AFM has been used to study the nanometre-scale changes in lipid bilayers containing anesthetics, where the anesthetic was found to increase the stiffness of a fluid-phase bilayer. Such changes in bilayer properties could affect the functioning of membrane proteins like ion channels, which are central to intercellular communication between neurons.

Friction Measurement Between Polyester Fibres Using the Fibre Probe SPM

Hiroyasu Mizuno, Mikael Kjellin,
Niklas Nordgren, Torbjörn Pettersson,
Viveca Wallqvist, Matthew Fielden,
Mark W. Rutland

Aust. J. Chem. **2006**, *59*, 390–393.

Measurement of friction at the submicron level is important for understanding how lubricants work and also how a conditioner affects the feel of clothes or hair. It has not previously been possible to measure friction between single fibre contacts but this has now been achieved using the AFM. We show how surfactants (or lubricants) can modify the frictional properties of fibres to achieve considerably reduced adhesion and friction.

Microstructures in Lubricant Thin Layers at the Magnetic Disk Surface, Observed Using Cryogenic Atomic Force Microscopy

Teiji Kato, Takayuki Nakakawaji

Aust. J. Chem. **2006**, *59*, 394–399.

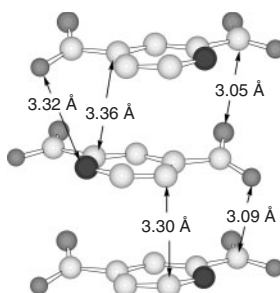
Surface lubrication of hard disks (HDs) used for computer magnetic memory is achieved by an ultra-thin (1 nm) lubricant layer. A molecular-level understanding of the lubricant, Z-dol, and its surface wear properties are essential for developing future HD systems. On a non-polar surface, the title technique reveals Z-dol molecules fuse to form a reversed micelle structure; on a polar hydrophilic surface, Z-dol molecules can stably exist as single molecules without fusion. On HD surfaces, Z-dol molecules form flat ellipsoidal shapes irrespective of preparation methods.

Full Papers

Lead(II) Complexes of Pyridinedicarboxylates — Lattice Interactions and Metal Ion Stereochemistry

Jack M. Harrowfield, Noël Lugan,
Farzin Marandi,
Gholam H. Shahverdizadeh, Ali A. Soudi

Aust. J. Chem. **2006**, *59*, 400–406.

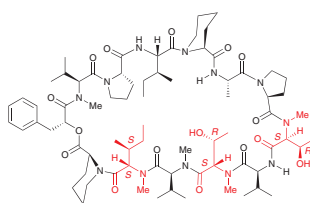


Lead(II) coordination frequently involves a close balance of several weak interactions. In an effort to establish a ranking of these forces, the title family of complexes were prepared. Whether a lone pair is truly localized on Pb or involved in weak Pb...Pb bonding is one of the issues arising.

Determination of the Complete Absolute Configuration of Petriellin A

Luigi Aurelio, Robert T. C. Brownlee,
Jason Dang, Andrew B. Hughes,
Gideon M. Polya

Aust. J. Chem. **2006**, *59*, 407–414.



Elucidation of natural product structures facilitates the synthesis and study of biological activity and drug development. The complete absolute configuration of petriellin A (shown) was unknown but was completed by the Marfey derivatization method for amino acids. This knowledge makes possible synthetic design and conformational analysis in an antifungal drug development program.