

AUSTRALIAN JOURNAL OF CHEMISTRY

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RESEARCH FRONT: Colloids and Interface Science

Foreword

Australian Colloid and Surface Science in 2007

R. Crawford, E. J. Wanless

Aust. J. Chem. **2007**, *60*, 627–629.

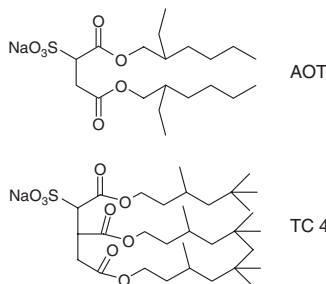
This special issue of the *Australian Journal of Chemistry* comprises a selection of papers from the program of the Australian Colloid and Interface Symposium, held at Coogee Beach, Sydney in February 2007. Over 240 scientists gathered at Coogee for this meeting, including 93 international guests from over 20 different countries.

Current Chemistry

Hydrocarbon Surfactants for CO₂: An Impossible Dream?

J. Eastoe, S. Gold, D. C. Steytler

Aust. J. Chem. **2007**, *60*, 630–632.



To obtain fluorine-free CO₂-compatible surfactants for possible use in CO₂ handling, the CO₂-philicity of CO₂-insoluble hydrocarbon compounds is increased by modifying the chain structures. The CO₂ solubility of a number of aerosol-OT (AOT) analogues increases as the chain tip methylation and number of chains increases (e.g., TC 4). High-pressure techniques are used to characterize the solubility and aggregation of the CO₂-philes.

Foams and Emulsions: the Importance of Structural Forces

D. T. Wasan, A. D. Nikolov

Aust. J. Chem. **2007**, *60*, 633–637.

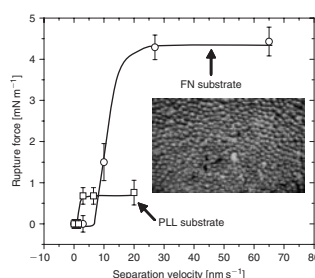
The stability of foams and emulsions is controlled by using nanocolloids such as surfactant micelles, proteins, macromolecules and nanoparticles. We have used a thin film approach as well as Kossel diffraction and direct optical imaging methods to directly observe the structure and stability of foam and emulsion systems. Our experimental results and theoretical calculations show that the stability of concentrated systems is strongly influenced by the structural force arising owing to the nanocolloidal-ordered structure formation between or around bubbles and droplets.

Full Papers

Direct Measurement of Mechanical and Adhesive Properties of Living Cells Using Surface Forces Apparatus

*X. Banquy, J.-M. Rabanel, P. Hildgen,
S. Giasson*

Aust. J. Chem. **2007**, *60*, 638–645.

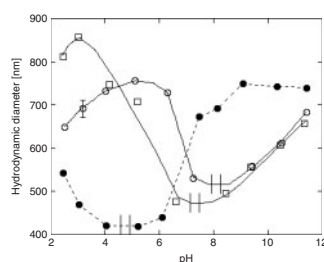


Cell–substrate interactions, which govern many biological processes (e.g., wound healing), mediate cell mechanical and adhesive properties. Most techniques used to investigate cell properties are limited to local measurement on isolated or single cells. Here, the surface forces apparatus (SFA) technique is used to directly measure the mechanical and adhesive properties of a monolayer of macrophage living cells on different substrates.

Biocompatible, Polyampholyte Microgel Particles

M. Bradley, B. Vincent, G. Burnett

Aust. J. Chem. **2007**, *60*, 646–650.



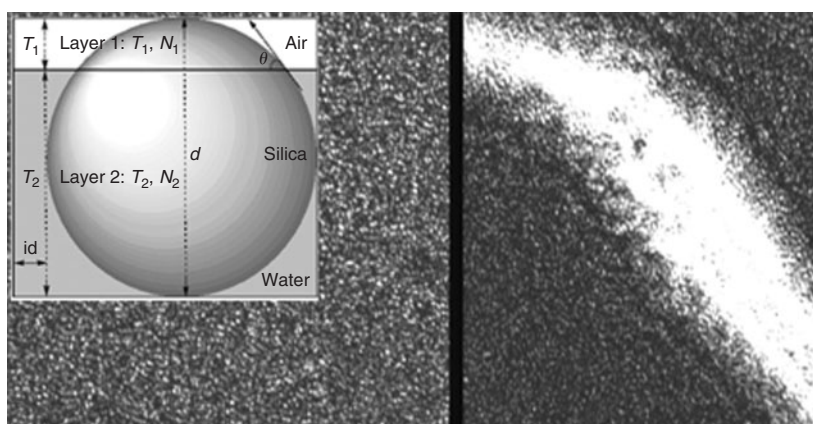
Polyampholyte microgel particles that swell with solvent at low and high pH and collapse at intermediate pH values have been prepared. Their synthesis was achieved by a simple acid hydrolysis reaction of polyelectrolyte microgel particles. The polyampholyte microgel particles are composed of biocompatible polymers and could be of interest in biomedical applications.

Determination of Contact Angles of Nanosized Silica Particles by Multi-Angle Single-Wavelength Ellipsometry

T. N. Hunter, G. J. Jameson, E. J. Wanless

Aust. J. Chem. **2007**, *60*, 651–655.

The evaluation of nanoparticle wettability is important to both the handling and the ultimate utility of nanoparticles. Presented here for the first time is a technique to measure the specific air–water contact angle of silica nanoparticles using ellipsometry. This novel technique can yield much information on both the wettability and structure of particle monolayers at interfaces.

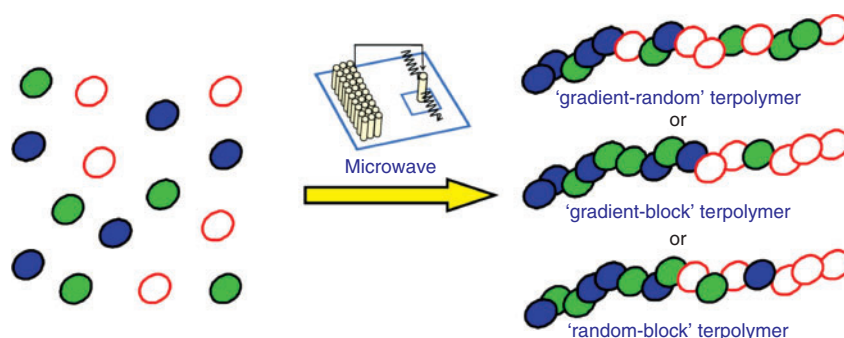


Kinetic Investigations on Microwave-Assisted Statistical Terpolymerizations of 2-Oxazoline Monomers

R. Hoogenboom, F. Wiesbrock, M. A. M. Leenen, M. van der Loop, S. F. G. M. van Nispen, U. S. Schubert

Aust. J. Chem. **2007**, *60*, 656–661

The monomer distribution in well-defined copolymers can greatly affect the macroscopic polymer properties. Hence, we investigated the polymerization kinetics for statistical 2-oxazoline terpolymerization, demonstrating the formation of various architectures with different monomer distributions. These novel insights are believed to allow further fine-tuning of polymer properties, leading to the future development of materials with unprecedented thermal, interfacial and self-assembly properties.



Surface Charge Modification of Nano-Sized Silica Colloid

K. N. Pham, D. Fullston, K. Sagoe-Crentsil

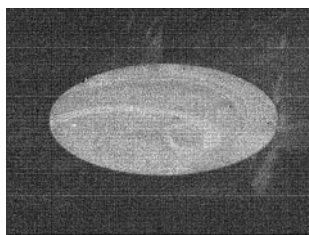
Aust. J. Chem. **2007**, *60*, 662–666.

The surface of nanometre-size silica particles is modified to change its electrical charge and make the particles more stable, not only in water but in other solvents as well. Different chemicals used for surface modification are compared using a new data analysis technique from light scattering experiments. The results shed light on the fundamental issues in stability of nano-sized silica suspensions.

Real-Time Detection of Antigen–Antibody Reactions by Imaging Ellipsometry

*I. Chamritski, M. Clarkson,
J. Franklin, S. W. Li*

Aust. J. Chem. **2007**, *60*, 667–671.



A method that allows label-free real-time determination of the interaction of an antibody with antigens immobilized on a silicon surface is developed using imaging ellipsometry. All stages of the antigen–antibody complex formation (e.g., anti-human IgG/human antibody, see Fig.) can be imaged by imaging ellipsometry. The method allowed the affinity constants for two reactions (antibody/antigen) to be calculated.

Focus

Measurement of Slip and Surface Forces using a Torsional Oscillator

G. Willmott

Aust. J. Chem. **2007**, *60*, 672.

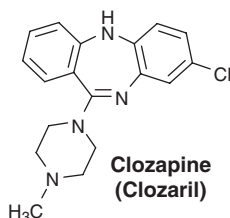
The difference between the velocity of a solid surface and the mean velocity of a fluid adjacent to the surface, i.e., surface slip, is an important parameter in fluid mechanics. Here, the use of a composite torsional oscillator, a versatile, high-precision tool for probing cohesive fluid–solid surface forces and, therefore, slip is presented.

Full Papers

Aminimides as Potential CNS Acting Agents. I. Design, Synthesis, and Receptor Binding of 4'-Aryl Aminimide Analogues of Clozapine as Prospective Novel Antipsychotics

*B. Capuano, I. T. Crosby, E. J. Lloyd,
J. E. Neve, D. A. Taylor*

Aust. J. Chem. **2007**, *60*, 673–684.

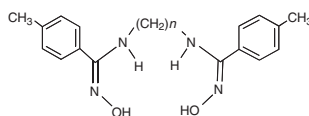


This paper describes the incorporation of the aminimide functional group into analogues of the antipsychotic, clozapine. Aminimides are reported to improve aqueous solubility, the lack of which has proven to be a problem in other analogues. The derived analogues show modest activity at receptors implicated in schizophrenia.

Bisamidoximes: Synthesis and Complexation with Iron(III)

*J. E. Johnson, C. Carvalho,
D. D. Dolliver, N. Sanchez, V. Garza,
D. C. Canseco, G. L. Eggleton,
F. R. Fronczek*

Aust. J. Chem. **2007**, *60*, 685–690.



Several bisamidoximes and a trisamidoxime have been prepared from 4-methylbenzaldehyde by a three-step synthesis. Single crystal X-ray structures of three of the bisamidoximes have shown that the two amidoxime moieties have the Z configuration in all three compounds. Some of the amidoximes form 1:1 complexes with iron(III).

Increased Valence or Electronic Hypervalence for Symmetrical Three-Centre Molecular Orbital Configurations

R. D. Harcourt

Aust. J. Chem. **2007**, *60*, 691–695.



With one overlapping atomic orbital on each of three atomic centres, symmetrical three-centre molecular orbital configurations with one to five electrons can be constructed. It is deduced that, for each configuration, the valence of the central atom can exceed unity, as can occur for the A atom in each of the displayed valence bond structures with one to four electrons.

Focus

Aptamers: Molecular Binding Agents with Application in Targeted Cancer Treatment

N. Orkey

Aust. J. Chem. **2007**, *60*, 696.

This article is a focus review about aptamers, which are chemical agents that can bind small chemicals, proteins and antigens on the surface of cells. They can also be used to transport drugs to specific cells, making them the new frontier in targeted cancer treatment.