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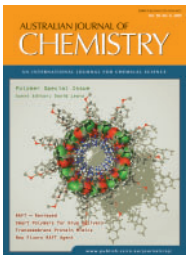
Volume 58, Number 6, 2005, xvii



The cover shows a model of a dendritic dipeptide self-assembly; its tubular structure mimics that of porous transmembrane proteins. Learn more in the paper by Percec et al. (p. 472).

AUSTRALIAN JOURNAL OF CHEMISTRY

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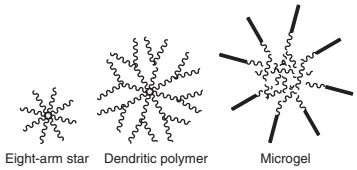
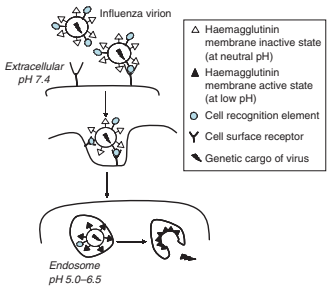
Foreword

This issue of the *Australian Journal of Chemistry* features recent advances in macromolecular science, from self-assembling structures to drug delivery agents and from new materials to polymerization techniques.

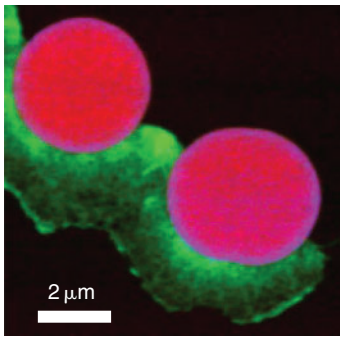
Reviews



RAFT polymerization has emerged as one of the most versatile techniques for producing polymers of well defined architecture (some examples of which are shown here). This comprehensive review outlines the development, scope, and mechanism of living radical polymerization with reversible addition–fragmentation chain transfer.

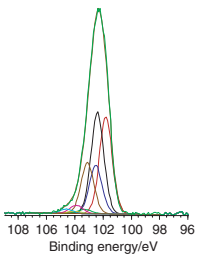


Viruses are very efficient at overcoming cellular membrane barriers and infecting cells. Peptides and polymers mimicking this viral function have been designed to enhance the intracellular delivery of therapeutics. This review summarizes natural and synthetic systems that are able to cross the cellular membranes and so deliver drugs to cells.



Chemical speciation and quantitative mapping of polymers by synchrotron soft X-ray microscopy is proving useful in many areas of polymer science. The capabilities of this technique are explored in the review. The graphic shows a colour-composite image of a controlled-release microcapsule, and reveals the distribution of divinylbenzene, polyurea, and the compatibilizer, maleic anhydride, in the tectocapsule.

Current Chemistry



The similarity of the phenomena of plasma and corona treatment on silicones has warranted their review here. In both cases a thin silica-like surface layer that greatly enhances wetability results. The advent of atmospheric pressure glow discharge, a technique that brings these two treatments closer together, is highlighted.

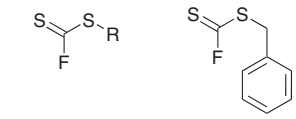
0004-9425/05/060xvii

Rapid Communications

A Synthetic Approach to a Novel Class of Fluorine-Bearing Reversible Addition–Fragmentation Chain Transfer (RAFT) Agents: F-RAFT

Alexander Theis, Martina H. Stenzel, Thomas P. Davis, Michelle L. Coote, Christopher Barner-Kowollik

Aust. J. Chem. **2005**, *58*, 437–441.



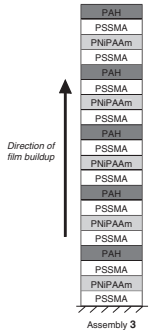
General structure BFDF

The construction of block copolymers from monomers differing markedly in reactivity has long been problematic. The theoretical design of novel RAFT agents able to accommodate the polymerization of such a system is actualized by the synthesis and use of benzyl fluoro dithioformate, BFDF. Such agents, bearing a fluorine Z-group, are termed F-RAFT agents.

Stabilization of Hydrogen-Bonded Poly(*N*-isopropylacrylamide) Multilayers by a Dual Electrostatic/ Hydrogen Bonding Copolymer

John F. Quinn, Frank Caruso

Aust. J. Chem. **2005**, *58*, 442–446.

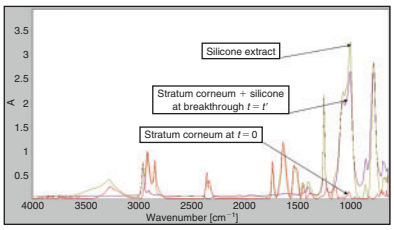


Multilayer thin films incorporating a polymer capable of both electrostatic and hydrogen-bonding interaction were prepared. By including both electrostatic and hydrogen-bonding interlayers, the pH stability of the assembly could be substantially improved compared with solely hydrogen-bonded assemblies. These films have applications as stimulus-responsive smart materials.

Silicone Polymers in Scar Remediation: The Role of Migration of Oligomers Through Stratum Corneum

Washington Sanchez, John Evans, Graeme George

Aust. J. Chem. **2005**, *58*, 447–450.

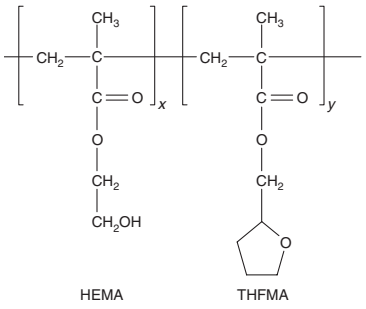


Silicone gels based on lightly cross-linked poly(dimethyl siloxane) are used to limit the effects of scarring after re-epithelialization of a severe burn. This article demonstrates, through the use of ATR–FTIR spectroscopy (shown), that the silicone oligomers from the gel migrate and traverse the natural stratum corneum after a continuous application period of around one week at skin temperature.

Vitamin B_{12} Release from Poly(HEMA-*co*-THFMA) in Water and SBF: A Model Drug Release Study

Mohammad A. Chowdhury, David J. T. Hill, Andrew K. Whittaker

Aust. J. Chem. **2005**, *58*, 451–456.



HEMA THFMA

Crosslinked hydrophilic polymers are of interest as drug delivery matrices—on ingress of penetrant fluid the water-soluble drug within the matrix is released. Water and simulated body fluid diffused into poly(HEMA-*co*-THFMA), shown in the graphic, according to Fickian diffusion kinetics but the rate of diffusion was significantly affected by the presence of low (<20%) amounts of THFMA in the predominantly HEMA-based material.

Current Progress on Biodegradable Materials Based on Plasticized Starch

Laurent Bélard, Patrice Dole, Luc Avérous

Aust. J. Chem. **2005**, *58*, 457–460.

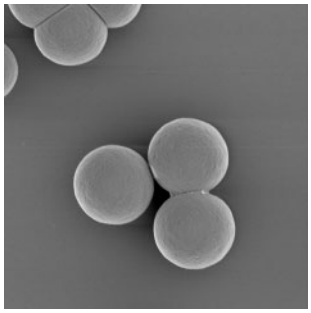
Native starch can be transformed into thermoplastic-like polymers after destructuration and plasticization processes. This material, being derived from renewable resources, fully degradable, and relatively inexpensive, is attractive for short-lived application, such as in surgery or packaging. The as-prepared material is however moisture-sensitive; reported herein is a plasma treatment to alleviate this limitation.

A Method for Preparing Low-Allergen Natural Rubber Latex

Kathireson Vivaygananthan, Pin-Fa Lai, Seng-Neon Gan, Christopher M. Fellows, Robert G. Gilbert

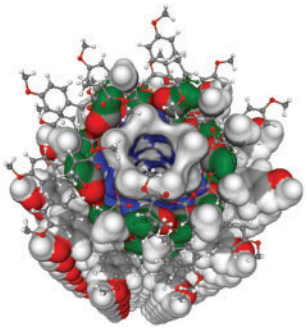
Aust. J. Chem. **2005**, *58*, 461–467.

Natural rubber latex (NRL) has unequalled mechanical properties for barrier applications such as surgical gloves. Unfortunately NRL can induce a protein allergy on skin contact. Radical grafting of poly(dimethylaminoethyl methacrylate) onto NRL allows production of a film that retains the mechanical properties of NRL but reduces the allergenicity 50-fold.

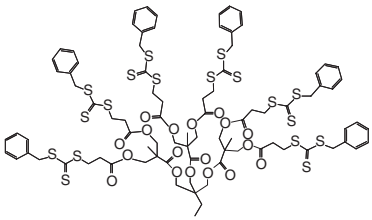


Crosslinked poly(divinylbenzene) microspheres, prepared by precipitation polymerization, were used as cores to graft *N*,*N*′-dimethyl acrylamide and *n*-butyl acrylate by both reversible addition–fragmentation chain transfer and conventional free radical polymerization. The resultant grafted microspheres, e.g. poly(DVB-80-*graft*-*n*-butyl acrylate) shown here, were characterized. Significant differences in their weight increase are discussed.

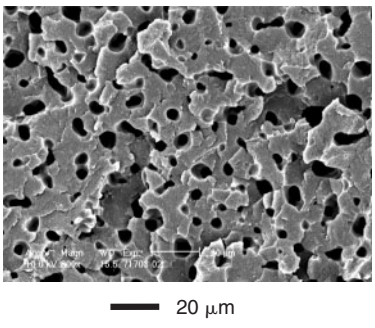
Full Papers



Amphiphilic dendritic dipeptides self-assemble, both in solution and in bulk, into supramolecular helical porous or tubular columns and, therefore, provide a general synthetic strategy to mimic the structure of porous transmembrane proteins. Reported herein is the synthesis of the dendritic dipeptides (4-3,4,5-3,5)nG$_2$-CH$_2$-Boc-L-Tyr-L-Ala-OMe (n = 12, 16), their self-assembly in solution and in solid state, and their structural analysis.



The successful synthesis of star-shaped block copolymers of styrene and *n*-butyl acrylate by RAFT polymerization is reported. The use of modified dendritic cores as macro-star-RAFT agents to mediate the polymerization resulted in stars of three, six, or twelve arms, depending on the generation of dendritic core used.



In the search for more environmentally benign methods to form foams, research into nanocomposite foams that use CO_2 as the foaming agent is proving promising. Here, the addition of nanoclay to polystyrene and the effect on the foaming process with CO_2 after exfoliation and clay surface modification were investigated.