

# AUSTRALIAN JOURNAL OF CHEMISTRY

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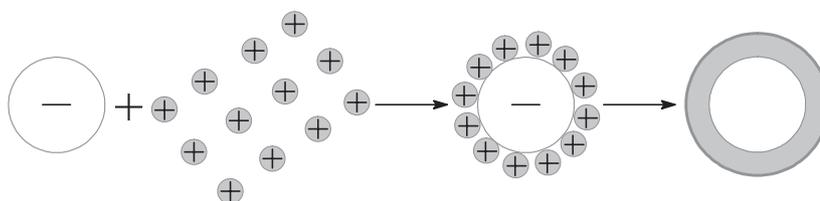
## Review

### The Fabrication and Progress of Core-Shell Composite Materials

Shunsheng Cao, Juanrong Chen,  
Jie Hu

*Aust. J. Chem.* **2009**, *62*, 1561–1576.

The fabrication of core-shell composite materials continues to be of significant interest for potential applicability in catalysis, semiconductors, magnetic composites, drug delivery, enzyme immobilization, molecular recognition, chemical sensing, etc. As a result, their production has led to numerous practical and conceptual developments in that direction. This review presents an overview of the synthetic strategies and highlights recent advances in the fabrication of the core-shell composite particles that will continue to optimize existing approaches and to drive new procedures in this field.

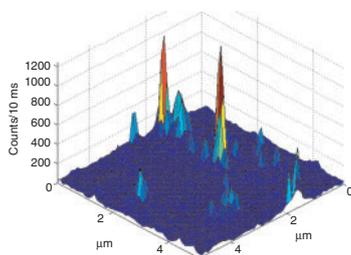


## Full Papers

### Synthesis and Single Chain Fluorescence of a Sulfonated Conjugated Polymer

Daniel E. Gómez, Tina A. T. Tan,  
Jonathan M. White, Toby D. M. Bell,  
Kenneth P. Ghiggino

*Aust. J. Chem.* **2009**, *62*, 1577–1582.



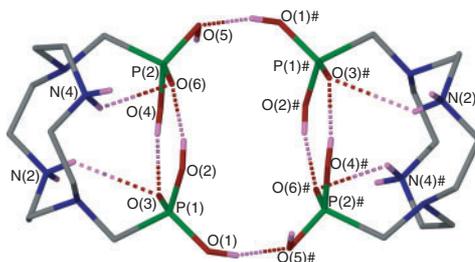
Water-soluble conjugated polymers have potential applications as luminescent sensors and photovoltaic materials. The synthesis and single molecule fluorescence properties of a novel water-soluble sulfonated conjugated polymer are reported in this work. The photophysical processes occurring are shown to be polymer chain and environment dependent.

### X-Ray Crystal Structure, Acid–Base Properties and Complexation Characteristics of a Methylenephosphonate Derivative of 1,4,7,10-Tetraazacyclododecane

Ute Kreher, Milton T. W. Hearn,  
Leone Spiccia

*Aust. J. Chem.* **2009**, *62*, 1583–1592.

Stable copper(II) and nickel(II) complexes bound to chromatographic supports are highly effective agents for the separation and purification of proteins via immobilized metal affinity chromatography (IMAC). In order to use less toxic metal ions, we have been developing immobilized macrocyclic phosphonate ligands for use with hard metal ions. Investigations of the metal binding properties of such ligands indicate that the  $\text{Fe}^{3+}$  and  $\text{Zn}^{2+}$  complexes, and, to a lesser extent, the  $\text{Ca}^{2+}$  complex will be versatile candidates for use in the IMAC protein purification.

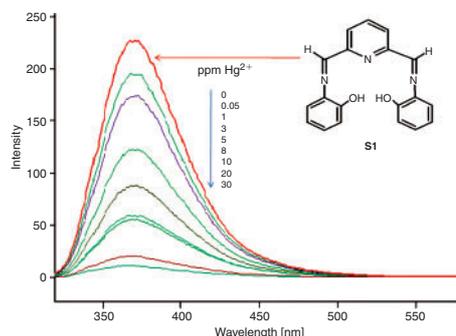


### A Highly Selective Luminescent Sensor for Detecting Mercuric Ions in Water

Sofian M. Kanan, Imad A. Abu-Yousef,  
Nora Hassouneh, Ahmed Malkawi,  
Naser Abdo, Marsha C. Kanan

*Aust. J. Chem.* **2009**, *62*, 1593–1599.

The ability to sense inorganic mercury ( $\text{Hg}^{2+}$ ) ions in solution is of great importance because this form is easily converted to the highly toxic methyl mercury that bioaccumulates in fish. Using the developed sensor **S1**, low concentrations of inorganic mercuric ions were selectively detected under typical pH values.

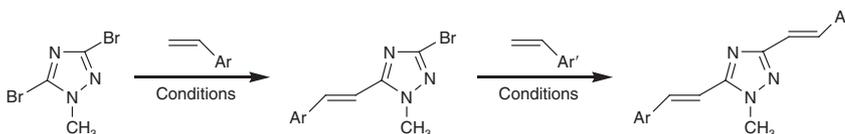


### Microwave-Controlled Preparation of Alkenyl-(1H)-1,2,4-triazoles: First Heck Reaction on a (1H)-1,2,4-Triazole Moiety

Ángel Díaz-Ortiz, Pilar Prieto,  
Abel de Cózar, Cristina Cebrián,  
Andrés Moreno, Antonio de la Hoz

*Aust. J. Chem.* **2009**, *62*, 1600–1606.

A new microwave-controlled synthetic approach for the preparation of alkenyl-1,2,4-triazoles is described. To the best of our knowledge, this is the first application of the Heck reaction to a dihalogenated 1,2,4-triazole. This approach allows the introduction of a wide range of equivalent or different alkenyl substituents in the 5- and/or 3-positions.

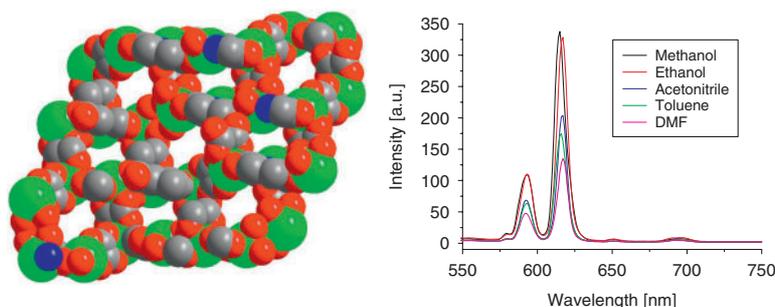


### Synthesis, Structure, and Photoluminescent Properties of Two New Microporous Eu(III) Coordination Polymers with 2,4,6-Pyridinetrioxycarboxylate

Cui-Jin Li, Wei Li, Zhao-Sha Meng,  
Meng-Xia Peng, Ming-Mei Yang,  
Ming-Liang Tong

*Aust. J. Chem.* **2009**, *62*, 1607–1613.

Two new three-dimensional microporous coordination polymers  $[\text{Eu}_5(\text{pyta})_5(\text{H}_2\text{O})_7] \cdot 3.5\text{H}_2\text{O}$  (**1**) and  $[\text{Eu}_2(\text{ox})_{1.5}(\text{pyta})(\text{H}_2\text{O})_4] \cdot 4.5\text{H}_2\text{O}$  (**2**) have been hydrothermally synthesized and structurally characterized. Both **1** and **2** emit the characteristic photoluminescent properties of the Eu(III) ion. Dehydrated **2** shows interesting solvent-dependent photoluminescent properties.

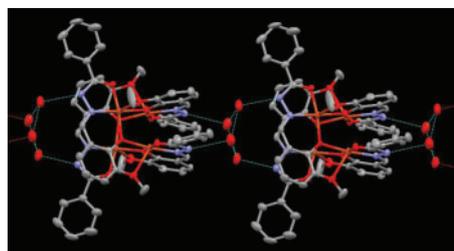


### A 'Butterfly'-Shaped Water Tetramer in a $\text{Cu}_4$ Complex Supported by a Hydrazone Ligand: Synthesis, Crystal Structure, Magnetic Properties, and Quantum Chemical Study

Sambuddha Banerjee, Soma Sen,  
Joy Chakraborty, Ray J. Butcher,  
Carlos J. Gómez García, Ralph Puchta,  
Samiran Mitra

*Aust. J. Chem.* **2009**, *62*, 1614–1621.

This paper describes the synthesis, X-ray crystal structure and VTM study of a tetranuclear  $\text{Cu}^{\text{II}}$  complex derived from a tetradentate hydrazone ligand  $\text{LH}_2$ . The voids of these tetramers are occupied by tetranuclear water clusters with a very large dihedral angle. This paper also details a theoretical calculation describing the stability of such water cluster.

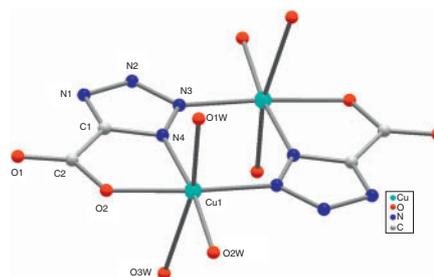


### New Copper(II) and Nickel(II) Complexes with Bifunctional Tetrazolate-5-carboxylate Ligands: Syntheses, Crystal Structures, and Magnetic Properties

A-Qing Wu, Qi-Yong Chen,  
Mei-Feng Wu, Fa-Kun Zheng,  
Feng Chen, Guo-Cong Guo,  
Jin-Shun Huang

*Aust. J. Chem.* **2009**, *62*, 1622–1630.

Four new Cu<sup>II</sup> and Ni<sup>II</sup> complexes with bifunctional tetrazolate-5-carboxylate ligands have been synthesized and structurally characterized. Variable-temperature magnetic susceptibility data show the presence of antiferromagnetic interactions in two dinuclear complexes.

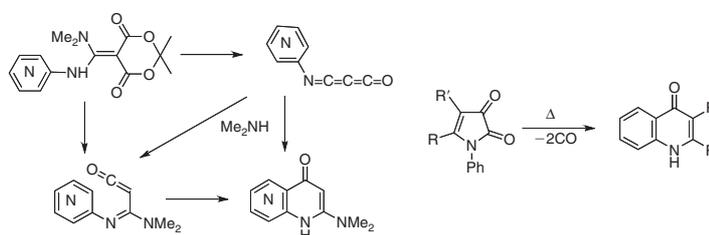


### Microwave-Induced Molecular Rearrangements. Flash Thermolysis in the Gas-Phase and in Solution: Synthesis of Quinolones and Naphthyridones

Delphine Lecoq, Benjamin A. Chalmers,  
Rakesh N. Veedu, David Kvaskoff,  
Paul V. Bernhardt, Curt Wentrup

*Aust. J. Chem.* **2009**, *62*, 1631–1638.

Quinolones and naphthyridones are obtained from Meldrum's acid and pyrroledione derivatives by flash vacuum thermolysis as well as by microwave-induced thermolysis in solution. A comparison of these two methods is provided.

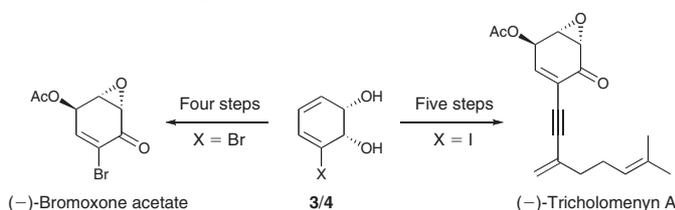


### Rapid, Chemoenzymatic Syntheses of the Epoxyquinols (–)-Bromoxone Acetate and (–)-Tricholomenyn A

David M. Pinkerton, Martin G. Banwell,  
Anthony C. Willis

*Aust. J. Chem.* **2009**, *62*, 1639–1645.

The illustrated and enantiomerically pure *cis*-1,2-dihydrocatechols **3** (X = Br) and **4** (X = I) have been converted into the epoxyquinols (–)-bromoxone acetate (**1**) and (–)-tricholomenyn A (**2**), respectively. Compounds **1** and **2** are typical examples of the simpler members of the ever growing class of epoxyquinol-based natural products.

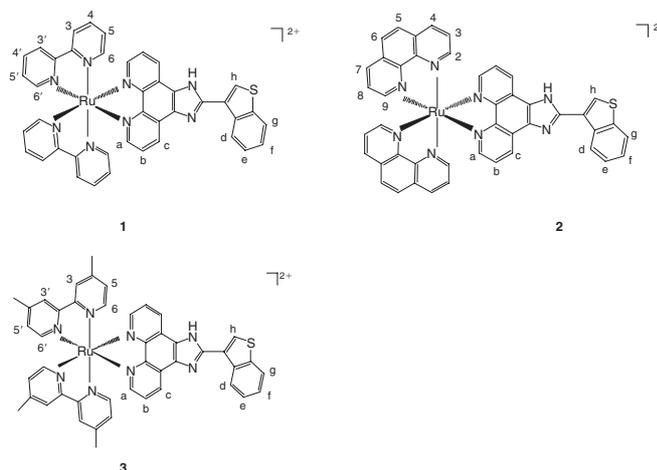


### Synthesis, Characterization, DNA-Binding, and DNA-Photocleavage Properties of Ru<sup>II</sup> Complexes

Lifeng Tan, Xuejiao Chen,  
Jianliang Sheng

*Aust. J. Chem.* **2009**, *62*, 1646–1654.

New Ru<sup>II</sup> complexes (**1–3**) of a polyridyl ligand 2-benzo[*b*]thiophen-3-yl-1*H*-1,3,7,8-tetraazacyclopenta-*[l]*phenanthrene (BTCP) have been synthesized and characterized and their DNA-binding properties investigated. The complexes bind to DNA intercalatively, with the ancillary ligands effecting the binding strengths. Complex **2** is a more effective DNA-cleaving agent than complexes **1** and **3**.

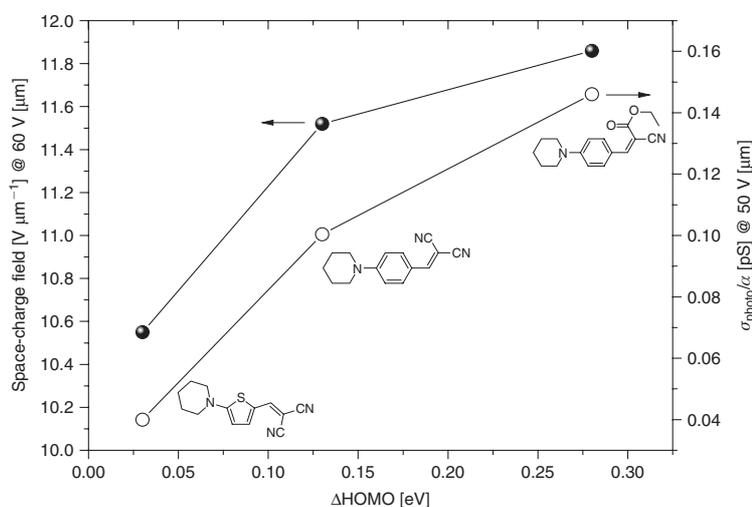


### The Influence of Chromophores on the Magnitude of Space-Charge Fields in Photorefractive Polymeric Composites

In Kyu Moon, Do Young Kim,  
Nakjoong Kim

*Aust. J. Chem.* **2009**, *62*, 1655–1660.

Three poly(*N*-vinylcarbazole)-based photorefractive composites with different non-linear optical chromophores at an operating wavelength of 632.8 nm are reported. The strength of the photoconductivity and the magnitude of the space-charge field in the photorefractive composites are strongly affected by the chromophore's highest occupied molecular orbital.

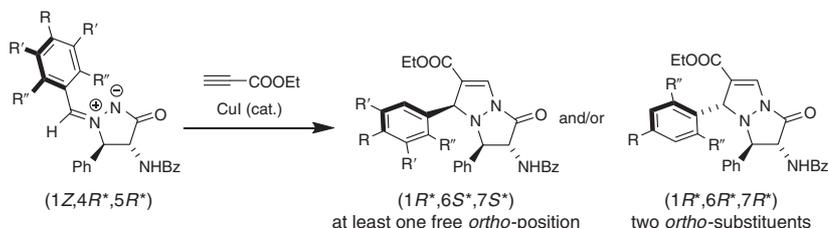


### Copper(I) Iodide-Catalyzed Cycloadditions of (1*Z*,4*R*\*,5*R*\*)-4-Benzamido-5-phenylpyrazolidin-3-on-1-azomethine Imines to Ethyl Propiolate

Lidija Pezdirc, Branko Stanovnik,  
Jurij Svete

*Aust. J. Chem.* **2009**, *62*, 1661–1666.

3+2 Cycloadditions of 4-acylamino-3-oxopyrazolidin-1-ium-2-ides are important reactions for the preparation of pyrazolo[1,2-*a*]pyrazole-based dipeptide analogues with variable amino acid sequence and configuration. In contrast to the poorly selective non-catalyzed cycloadditions,  $\text{Cu}^{\text{I}}$  catalyzed reactions of chiral pyrazolidin-3-one-1-azomethine imines with ethyl propiolate were highly regioselective and stereoselective. Diastereoselectivity was controlled by the *ortho*-substituents at the benzylidene residue. This synthetic methodology offers easy access to diversity-oriented libraries of polysubstituted pyrazolo[1,2-*a*]pyrazolones, useful in the search for novel bioactive compounds.

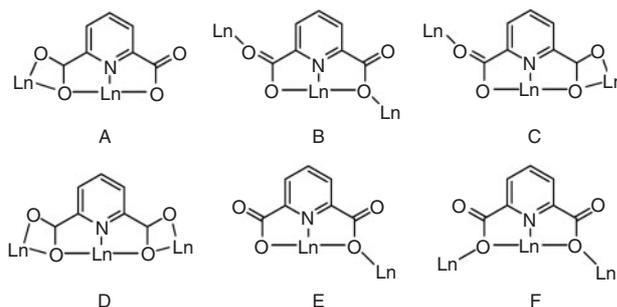


### Two-Dimensional Layered Metal–Organic Frameworks of Lanthanum(III) Pyridine-2,6-dicarboxylate

Yong-Ru Liu, Tao Yang, Lei Li,  
Jun-Min Liu, Cheng-Yong Su

*Aust. J. Chem.* **2009**, *62*, 1667–1674.

Three two-dimensional  $\text{La}^{\text{III}}$ -pyridine-2,6-dicarboxylate (pda) metal–organic frameworks have been synthesized by a hydro(solvo)thermal method, which show supramolecular isomerism and structural diversity as a result of alteration of crystallization conditions. The structures have been characterized by means of X-ray single-crystal diffraction, X-ray powder diffraction, and IR spectroscopy.

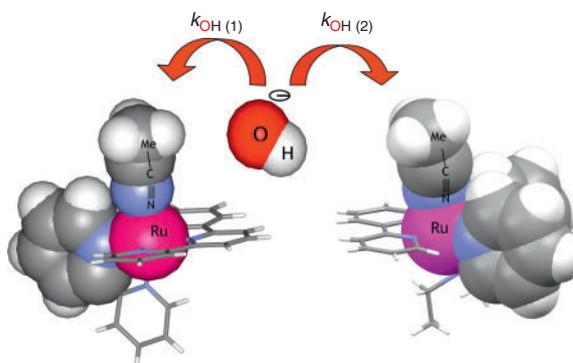


### Synthesis and Structure of Novel $\text{Ru}^{\text{II}}\text{-N}\equiv\text{C-Me}$ Complexes and their Activity Towards Nitrile Hydrolysis: An Examination of Ligand Effects

Joaquim Mola, David Pujol,  
Montserrat Rodríguez, Isabel Romero,  
Xavier Sala, Néstor Katz, Teodor  
Parella, Jordi Benet-Buchholz,  
Xavier Fontrodona, Antoni Llobet

*Aust. J. Chem.* **2009**, *62*, 1675–1683.

Steric and electronic effects govern a catalyst's performance, and their understanding and fine tuning allow the development of improved catalytic systems. Ruthenium complexes capable of hydrolyzing a MeCN bonded ligand under basic conditions are presented. A kinetic analysis together with related homologues allow determination of the influence of sterics and electronics in this reaction.

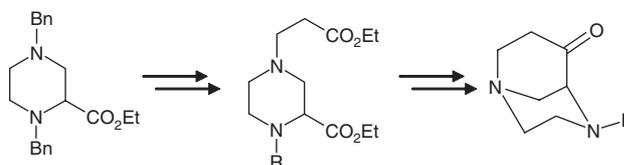


### Synthesis of 1,4-Diazabicyclo [3.3.1]nonan-6-ones

Daniel Kracht, Susumu Saito,  
Bernhard Wünsch

*Aust. J. Chem.* **2009**, *62*, 1684–1689.

Bridged piperazine derivatives represent privileged building blocks for the synthesis of conformationally restricted receptor ligands. Key steps in the synthesis are the regioselective addition of ethyl acrylate to piperazine-2-carboxylic acid ester and sodium hexamethyldisilazide-induced Dieckmann cyclization of piperazine-based diesters. The bridged piperazines contain a keto group and a protected secondary amine, which allow the introduction of pharmacophoric elements in a defined 3D orientation.

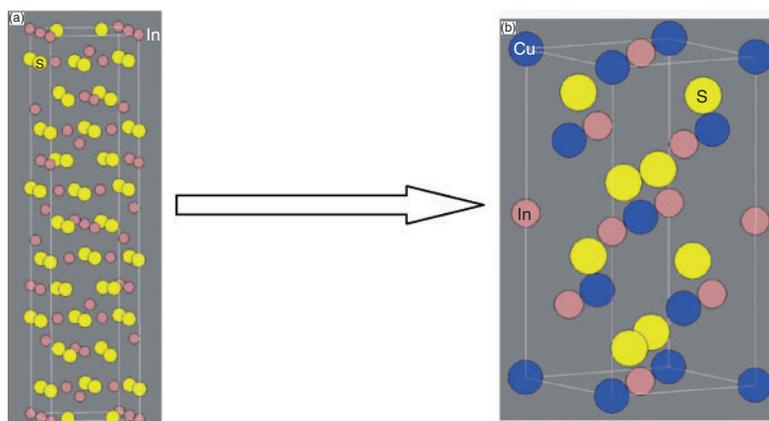


### Synthesis of $\text{CuInS}_2$ Microspheres using $\text{In}_2\text{S}_3$ Microspheres as Templates

Ming Ge, Changsheng Guo, Lu Liu,  
Baoquan Zhang, Zhen Zhou

*Aust. J. Chem.* **2009**, *62*, 1690–1694.

Ternary  $\text{CuInS}_2$  microspheres have been successfully synthesized through a simple solvothermal procedure with employing synthetic  $\text{In}_2\text{S}_3$  microspheres as templates.  $\text{CuInS}_2$  crystals assembled from  $\text{In}_2\text{S}_3$  microsphere building blocks were tetragonal phase and constructed by nanosheets. The evolution of crystal structure could be attributed to  $\text{Cu}^+$  ions insert into the  $\text{In}_2\text{S}_3$  microsphere templates, a part of  $\text{In}^{3+}$  ions were replaced and tetragonal  $\text{CuInS}_2$  crystals were formed during the solvothermal process.



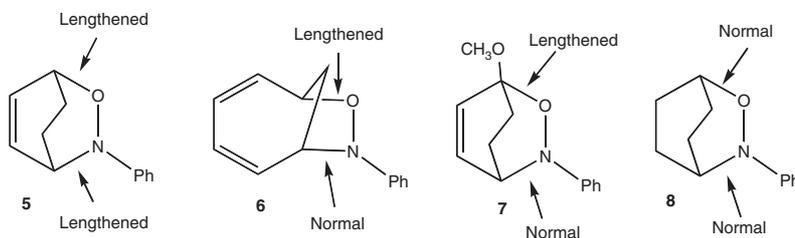
## Communication

**X-ray Structural Analysis for the Prediction on the Nature of the Retro Diels–Alder Pathway: Concerted or Stepwise. Structural Studies on Nitrosobenzene Cycloadducts**

*Jesse Roth-Barton, Jonathan M. White*

*Aust. J. Chem.* **2009**, *62*, 1695–1698.

Crystal structures of nitrosobenzene cycloadducts **5–7** reveal structural effects consistent with the early stages of the retro Diels–Alder fragmentation. There is a clear differentiation between the structure parameters of cycloadduct **5**, which reacts by a concerted synchronous pathway and that of cycloadduct **6**, which must react by a two-step pathway. Based on these data, cycloadduct **7** is predicted to react by a highly asynchronous or two-step pathway.



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