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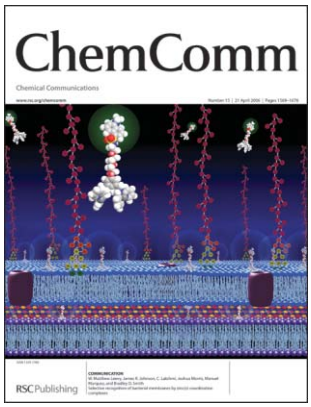
ISSN 1359-7345 CODEN CHCOFS (15) 1569–1676 (2006)

Cover
See Takashi Shirahata *et al.*, page 1592.
Two novel organic superconductors κ_{H}- and κ_{L}-(DMEDO-TSeF)$_2$[Au(CN)$_4$](THF) have been developed, where DMEDO-TSeF is the second example following TMTSF after an interval of 25 years as a sulfur-free donor providing an organic superconductor.
Image reproduced by permission of Takashi Shirahata, Megumi Kibune and Tatsuro Imakubo from *Chem. Commun.*, 2006, 1592.



Inside cover
See Bradley D. Smith *et al.*, page 1595.
Fluorescently labeled zinc coordination complexes can selectively stain the surfaces of bacterial cells, in preference to mammalian cells.
Image reproduced by permission of W. Matthew Leevy, James R. Johnson, C. Lakshmi, Joshua Morris, Manuel Marquez and Bradley D. Smith from *Chem. Commun.*, 2006, 1595.

CHEMICAL SCIENCE

Drawing together the research highlights and news from all RSC publications, *Chemical Science* provides a 'snapshot' of the latest developments across the chemical sciences showcasing newsworthy articles, as well as the most significant scientific advances.

Chemical Science

April 2006/Volume 3/Issue 4

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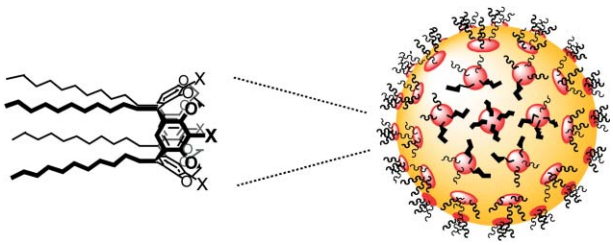
FEATURE ARTICLE

Calixarene-encapsulated nanoparticles: self-assembly into functional nanomaterials

Alexander Wei*

Calixarenes are excellent surfactants for mediating the self-assembly of nanoparticles into functional materials. Examples include gold nanoparticle arrays with tunable plasmonic responses, and cobalt nanoparticle rings with chiral magnetic states.



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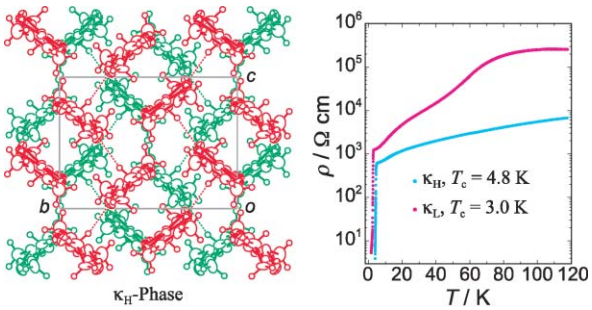

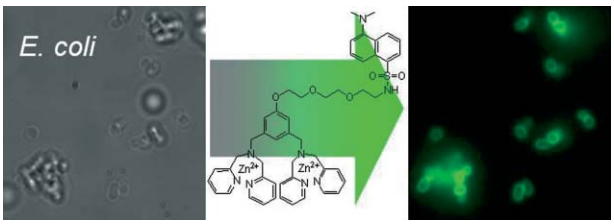

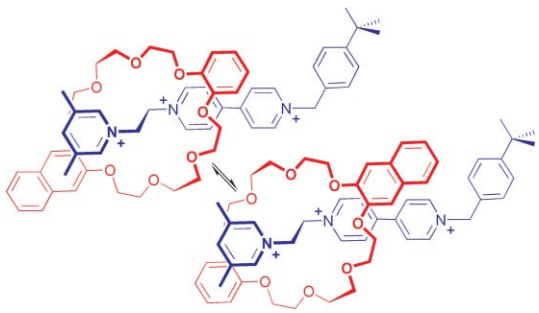

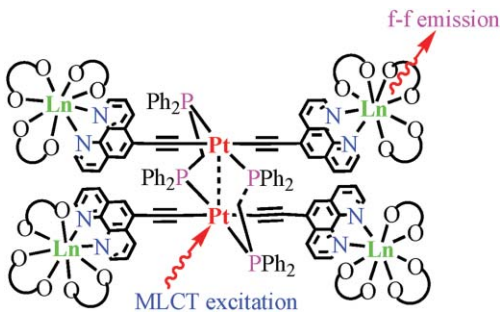

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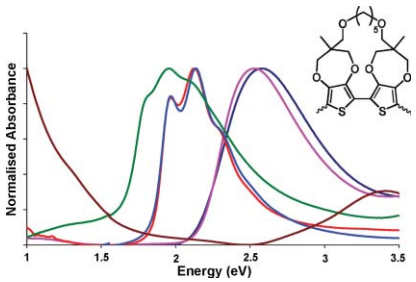
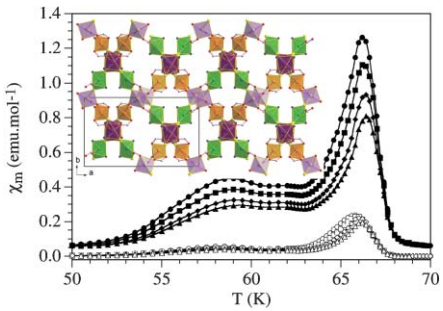


Conformational locking for band gap control in 3,4-propylenedioxythiophene based electrochromic polymers

Ryan M. Walczak, John S. Cowart, Jr., Khalil A. Abboud and John R. Reynolds*

The authors report a tethered poly(3,4-propylenedioxythiophene) derivative with a built-in polymer conformation restriction which locks the conjugated chain at a specific dihedral angle.

1607

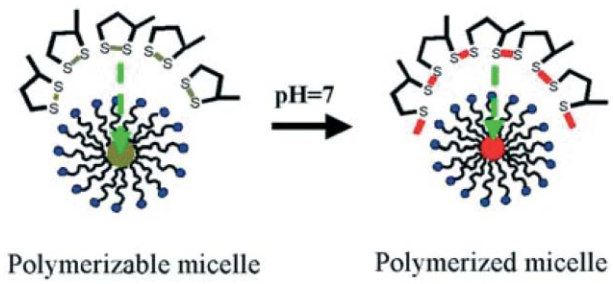


A new Co(II) coordination solid with mixed oxygen, carboxylate, pyridine and thiolate donors exhibiting canted antiferromagnetism with $T_C \approx 68$ K

Simon M. Humphrey, Antonio Alberola, Carlos J. Gómez García and Paul T. Wood*

A new thiolate-bridged coordination solid has been prepared using hydrothermal synthesis. The material has a spontaneous magnetic moment due to spin canting, and the strong magnetic exchange due to the thiolate ligands leads to a high ordering temperature of 68 K.

1610

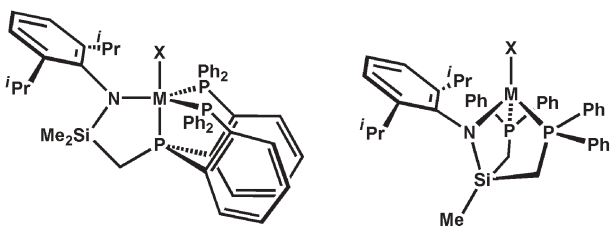


Polymerized surface micelles formed under mild conditions

Fang Liu, Mingfeng Wang, Zhiqiang Wang and Xi Zhang*

A new polymerizable surfactant 1-[11-(lipoyloxy)-undecyl]-pyridinium bromide was synthesized, which provides a new approach for polymerising micelles under mild conditions.

1613



Complexes of iron and cobalt with new tripodal amido-polyphosphine hybrid ligands

Matthew T. Whited, Eric Rivard and Jonas C. Peters*

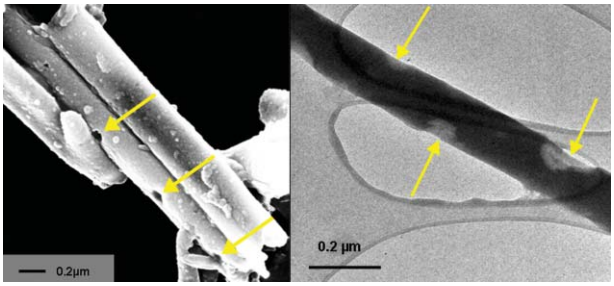
Divalent complexes of iron and cobalt with new, monoanionic tripodal amido-polyphosphine ligands have been thoroughly characterized, and XRD analysis reveals geometries that are distinct for this class of ligand.

1616

Perforated organometallic nanotubes prepared from a Rh N-heterocyclic carbene using a porous alumina membrane

Sathyajith Ravindran, G. T. Senthil Andavan, Chunglin Tsai, Cengiz S. Ozkan* and T. Keith Hollis*

A porous alumina membrane has been used to template an organometallic compound for the formation of 200 nm diameter hollow nanotubes that contain semi-regular perforations (nanopores).

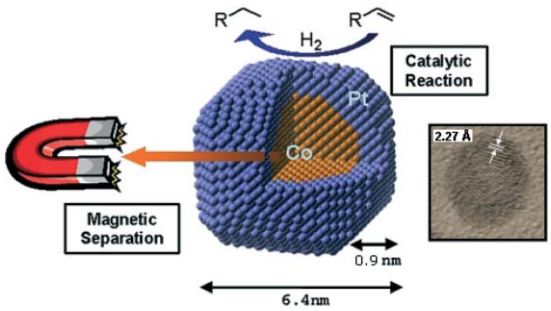


1619

Demonstration of a magnetic and catalytic Co@Pt nanoparticle as a dual-function nanoplatform

Chul-Ho Jun,* Young Jun Park, Ye-Rim Yeon, Joon-rak Choi, Woo-ram Lee, Seung-jin Ko and Jinwoo Cheon*

Co@Pt nanoparticles as a bifunctional nanoplatform system for the hydrogenation of various unsaturated organic molecules under mild conditions and also for magnetic separation and recycling are demonstrated.

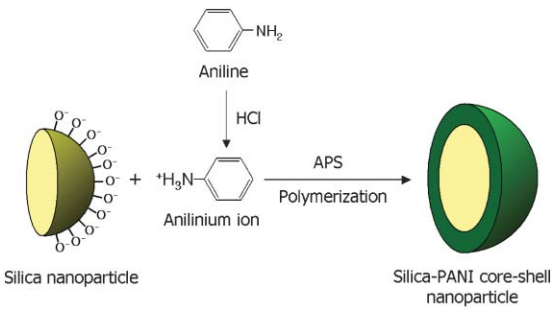


1622

Synthesis and characterization of monodisperse silica–polyaniline core–shell nanoparticles

Jyongsik Jang,* Jungseok Ha and Byungkwon Lim

Monodisperse silica–polyaniline core–shell nanoparticles with an average diameter of 26 nm were synthesized by *in-situ* polymerisation of aniline monomers adsorbed on the silica surface through electrostatic interactions.

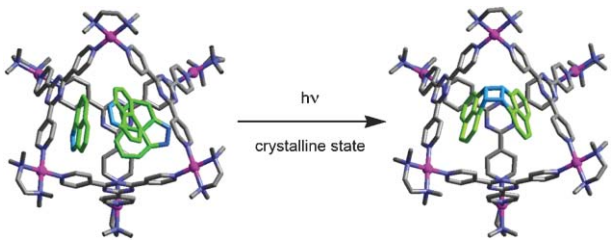


1625

Crystallographic observation of an olefin photodimerization reaction that takes place *via* thermal molecular tumbling within a self-assembled host

Kanji Takaoka, Masaki Kawano,* Tomoji Ozeki and Makoto Fujita*

The distances between the reaction centers of acenaphthylene guests in a self-assembled cage are larger than the Schmidt rule allows for topochemical coupling in the crystalline state. Nevertheless, [2 + 2] photodimerization takes place stereoselectively because the guests are mobile in the cavity.



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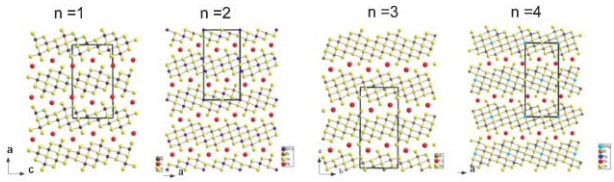
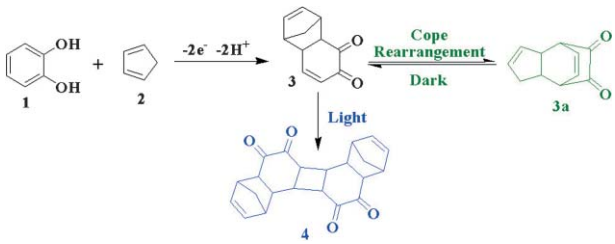


A new chalcogenide homologous series $A_2[M_{5+n}Se_{9+n}]$ (A = Rb, Cs; M = Bi, Ag, Cd)

Jun-Ho Kim, Duck-Young Chung and Mercouri G. Kanatzidis*

Understanding the building principles in homologies has implications in the design of solid state compounds. The new homology $A_2[M_{5+n}Se_{9+n}]$ (A = Rb, Cs; M = Bi, Ag, Cd; n = 1, 2, 3, 4) contains several members, some of which were predicted from the formula.

1631

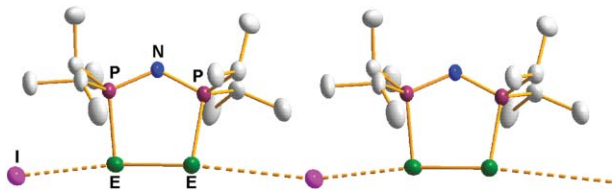


Electrochemical oxidation of catechol in the presence of cyclopentadiene. Investigation of electrochemically induced Diels–Alder reactions

Davood Nematollahi,* Mark S. Workentin and Esmail Tammari

We describe the synthesis and kinetic evaluation of compounds from [4 + 2] alone and [4 + 2] followed by [2 + 2] cycloaddition reactions of electrochemically generated *o*-benzoquinone with 1,3-cyclopentadiene.

1634

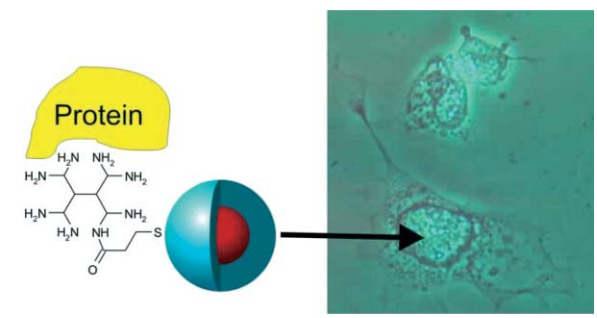


The cyclic $[N(P^iPr_2E)_2]^+$ (E = Se, Te) cations: a new class of inorganic ring system

Jari Konu, Tristram Chivers* and Heikki M. Tuononen

The formation of the cyclic cations, $[N(P^iPr_2E)_2]^+$ (E = Se, Te) with unusually long E–E bonds represents a novel feature of the chemistry of dichalcogenoimidodiphosphinate ligands. The iodide salts form infinite chains of non-planar five-membered rings linked by weak chalcogen–iodine contacts.

1637



Thiolated PAMAM dendrimer-coated CdSe/ZnSe nanoparticles as protein transfection agents

Adam C. Wisher, Igor Bronstein* and Victor Chechik*

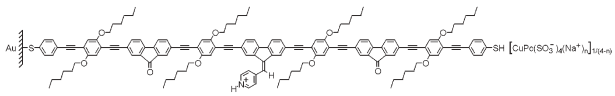
Dendrimer-coated CdSe nanoparticles help transport proteins across the cell membrane.

1640

Organic rectifying junctions from an electron-accepting molecular wire and an electron-donating phthalocyanine

Geoffrey J. Ashwell,* Wayne D. Tyrrell, Barbara Urasinska, Changsheng Wang and Martin R. Bryce*

Rectifying junctions with current ratios of 20–80 at ± 1 V have been obtained by protonating wire-like molecules and ionically coupling with anionic donors.



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On the origin of the Murchison meteorite phosphonates. Implications for pre-biotic chemistry

Ian B. Gorrell, Liming Wang, Alison J. Marks, David E. Bryant, Frédérique Bouillot, Andrew Goddard, Dwayne E. Heard and Terence P. Kee*

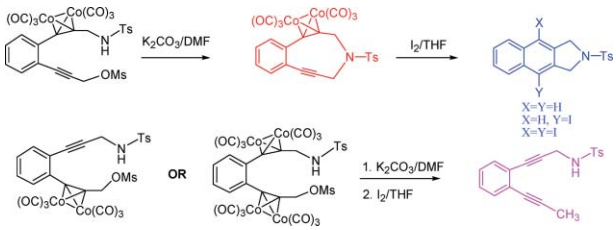
Ab initio calculations, combined with experimental studies on the anaerobic hydrolysis of phosphaalkynes under thermal and photochemical conditions suggest a potential, exogenous source of reduced oxidation state phosphorus for the early Earth.

1646

Synthesis and reactivity of a 9-membered azaenediyne: importance of proximity effect in *N*-alkylation

Sandip Kumar Roy and Amit Basak*

Synthesis of a 9-membered azaenediyne has been achieved for the first time *via* intramolecular *N*-alkylation. The importance of proximity of the reacting centres *via* cobalt carbonyl complexation of the acetylenic moiety has been demonstrated. The azaenediyne smoothly underwent Bergman cyclization even at 0 °C.

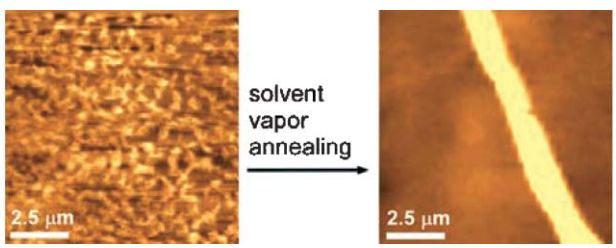


1649

Surface-assisted one-dimensional self-assembly of a perylene based semiconductor molecule

Aniket Datar, Randy Oitker and Ling Zang*

Chloroform-vapor annealing of thin films of propoxyethyl perylene tetracarboxylic diimide (PE-PTCDI, an n-type semiconductor) deposited on glass or mica leads to formation of well-defined one-dimensional self-assemblies (*e.g.* nanobelts), which show optically uniaxial properties as demonstrated by the linearly polarized emission.



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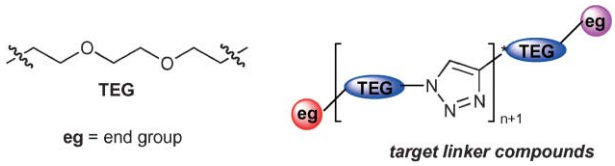
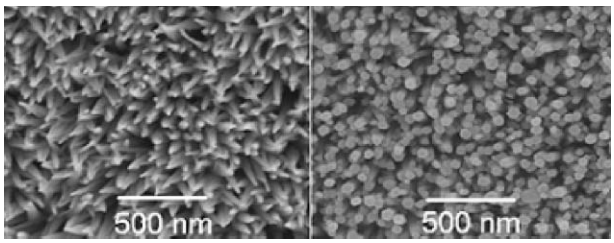


An iterative route to "decorated" ethylene glycol-based linkers

Genliang Lu, Sang Lam and Kevin Burgess*

Iterative copper-catalyzed cycloadditions of azides to alkynes were used to join functionalized triethylene glycol molecules to give "linkers" of defined lengths equipped with several different end-group functionalities.

1655

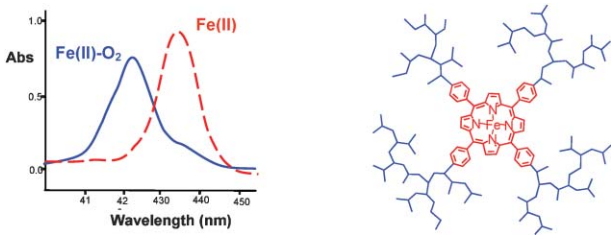


Controlled one-step fabrication of highly oriented ZnO nanoneedle/nanorods arrays at near room temperature

Xufeng Wu, Hua Bai, Chun Li, Gewu Lu and Gaoquan Shi*

Highly oriented ZnO nanoneedle/nanorods arrays have been fabricated by direct oxidation of zinc foil in alkaline zincate ion solution at near room temperature (20 °C for nanoneedles, 30 °C for nanorods).

1658

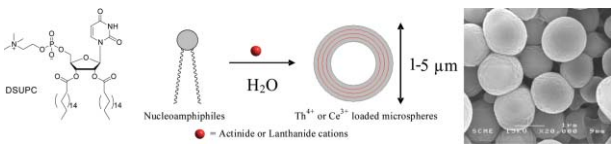


Porphyrin cored hyperbranched polymers as heme protein models

Lance J. Twyman* and Yi Ge

Synthesis of hyperbranched polymer possessing similar functionality, size and topology to the natural heme containing proteins is reported. Specifically the single step synthesis of a porphyrin cored hyperbranched polymer along with its ability to reversibly bind O_2 is described.

1661



Self-assembled microspheres from f-block elements and nucleoamphiphiles

Louis Moreau, Fabio Ziarelli, Mark W. Grinstaff and Philippe Barthélémy*

Hollow microspheres featuring a hybrid lipid–cation multilamellar shell are prepared by hydration of a nucleoside based amphiphile with an aqueous solution containing either actinide or lanthanide salts.

COMMUNICATIONS

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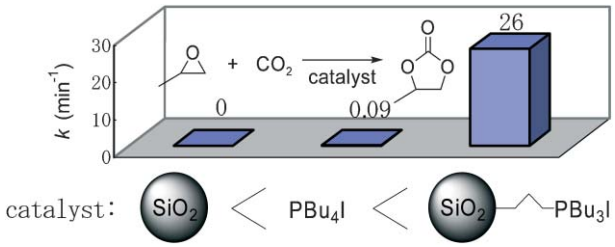
Synergistic hybrid catalyst for cyclic carbonate synthesis: Remarkable acceleration caused by immobilization of homogeneous catalyst on silica

Toshikazu Takahashi, Tsutomu Watahiki, Shoji Kitazume, Hiroyuki Yasuda and Toshiyasu Sakakura*

The catalytic activity of phosphonium salts towards cyclic carbonate synthesis from propylene oxide and CO_2 has been enormously enhanced by their immobilization onto silica that itself has no catalytic activity.



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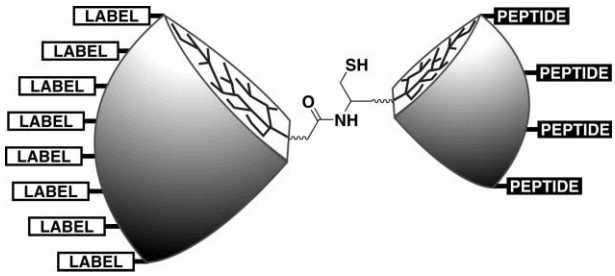
Strategy for the synthesis of multivalent peptide-based nonsymmetric dendrimers by native chemical ligation

Anouk Dirksen, E. W. Meijer,* Wencke Adriaens and Tilman M. Hackeng*

A strategy for the synthesis of multivalent peptide-based nonsymmetric dendrimers by native chemical ligation using poly(lysine) dendritic wedges as scaffolds is presented.



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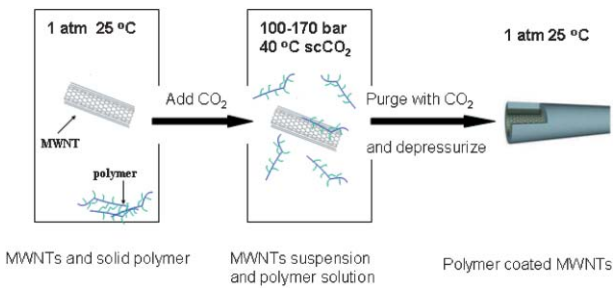
Coating carbon nanotubes with polymer in supercritical carbon dioxide

Jiawei Wang, Andrei N. Khlobystov,* Wenxin Wang,* Steven M. Howdle and Martyn Poliakoff

A facile and efficient method has been developed for coating MWNTs with solvent resistant polymer in $scCO_2$. It permits the selective deposition of high molecular weight fluorinated graft poly(methyl vinyl ether-*alt*-maleic anhydride) polymer onto MWNTs in $scCO_2$ under 100–170 bar at 40 °C. The coating layer has an average thickness of ~2 nm.



ADDITION AND CORRECTION

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An iron-catalysed chemo- and regioselective tetrahydrofuran synthesis

Gerhard Hilt, Patrick Bolze and Iris Kieltsch

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