

IN THIS ISSUE

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Cover

The "Place du Capitole" (the city hall of Toulouse) with the representation of a dendrimer instead of the "Croix du Languedoc", emblem of Toulouse and its area. Toulouse is the venue for the International Dendrimer Symposium 5. Image reproduced with permission from Jean Pierre Majoral.

CHEMICAL SCIENCE

C49

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

July 2007/Volume 4/Issue 7

www.rsc.org/chemicalscience

EDITORIAL

1039

State of the art developments in the chemistry and properties of dendrimers and hyperbranched polymers

Jean Pierre Majoral

The field of chemistry, properties and applications of dendrimers and hyperbranched polymers is introduced and illustrated with some key past and present developments at the interface of many disciplines.



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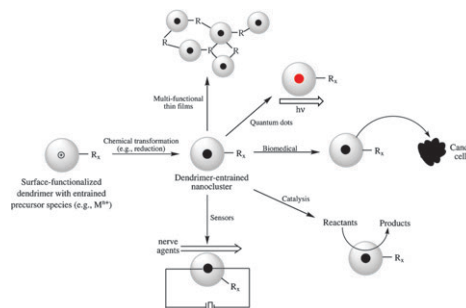
PERSPECTIVES

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Advances in the controlled growth of nanoclusters using a dendritic architecture

Jason K. Vohs and Bradley D. Fahlman*

This review provides a summary of recent synthetic strategies and applications related to nanoclusters entrained by dendritic polymers.

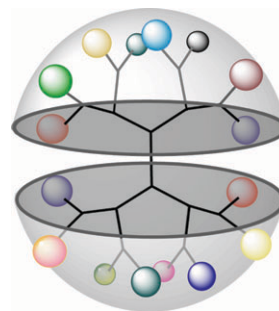


1052

Controlled functional group presentations in dendrimers as a tool to probe the hyperbranched architecture

Ashootosh V. Ambade, Yangbin Chen and S. Thayumanavan

Synthetic methods have been developed to introduce sequences in dendrimers in order to understand their fundamental properties.

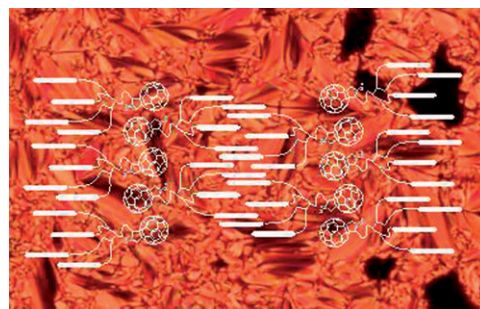


1064

Liquid-crystalline fullerodendrimers

Robert Deschenaux,* Bertrand Donnio and Daniel Guillon*

[60]Fullerenes covalently functionalized with mesomorphic dendrimers lead to self-assembled liquid-crystalline architectures that can be tuned by molecular design.

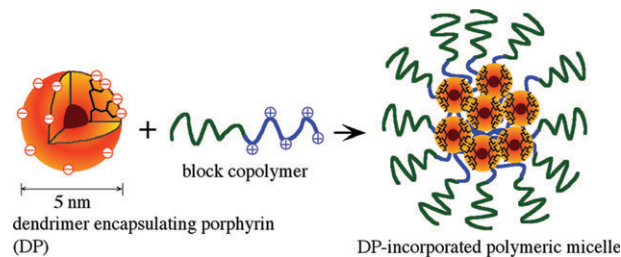


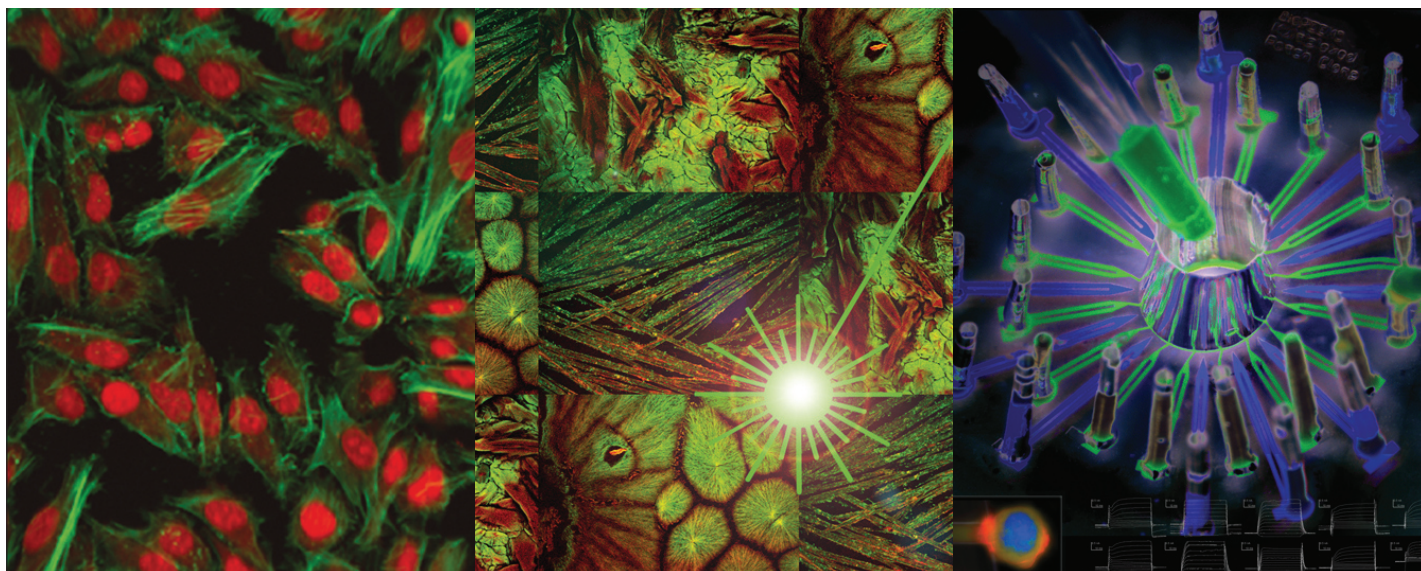
1074

Supramolecular nanocarriers integrated with dendrimers encapsulating photosensitizers for effective photodynamic therapy and photochemical gene delivery

Nobuhiro Nishiyama, Woo-Dong Jang and Kazunori Kataoka*

Dendrimer having photosensitizer core was incorporated into polymeric micelles, and showed no self-quenching of the center dye inside the micellar core due to its unique structure, leading to a remarkable photodynamic effect.





Biology in Focus

Biology in Focus highlights and draws together research in key areas at the chemistry/biology interface. Each quarterly instalment will showcase a different subject area, providing scientists with an opportunity to browse and view related science on specific themes. Research material is primarily drawn from three RSC journals: *Molecular BioSystems*, *Lab on a Chip* and *The Analyst*.



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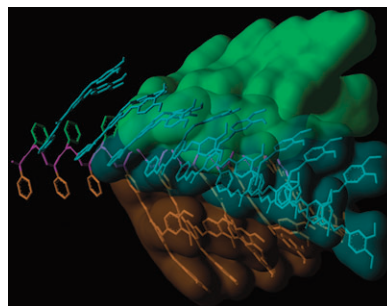
PERSPECTIVES

1083

Helical chirality in dendronized polyarylacetylenes

Jonathan G. Rudick and Virgil Percec*

A critical survey of efforts and successful strategies to program the handedness of helical, self-organizable dendronized polyarylacetylenes as well as of related dendronized polymers.

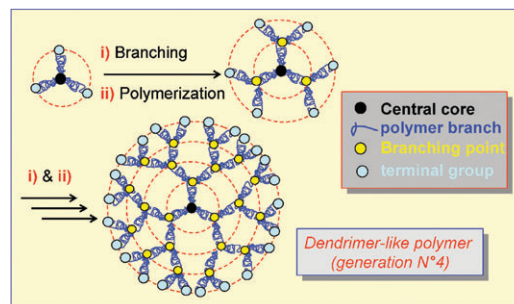


1097

Dendrimer-like polymers: a new class of structurally precise dendrimers with macromolecular generations

Daniel Taton,* Xiaoshuang Feng and Yves Gnanou*

This article highlights the various methods for synthesizing dendrimer-like polymers, the most powerful one by divergent growth being illustrated here.

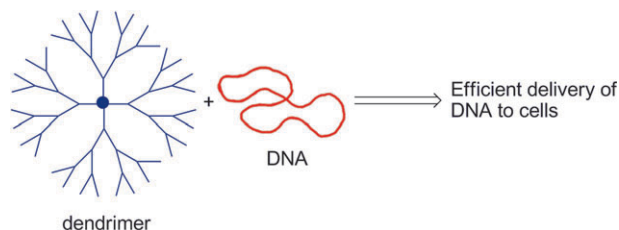


1111

Dendritic vectors for gene transfection

Marine Guillot-Nieckowski, Sara Eisler and François Diederich*

Dendrimers of various composition have been found to be efficient gene delivery vehicles and many synthetic strategies have been designed to fully exploit the transfection process.

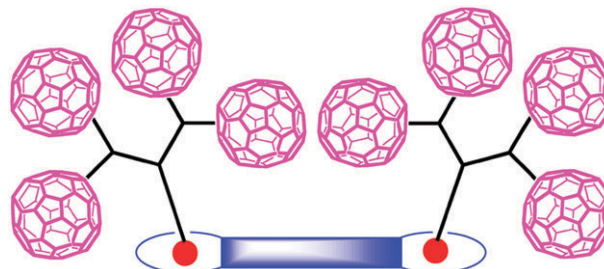


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Supramolecular chemistry for the self-assembly of fullerene-rich dendrimers

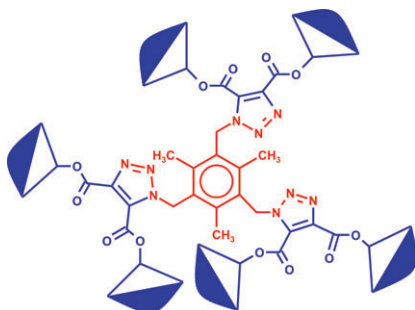
Uwe Hahn, François Cardinali and Jean-François Nierengarten*

The self-assembly of fullerene-containing components by using supramolecular interactions has recently generated significant research efforts. These results are summarized in the present account to illustrate the current state-of-the-art of fullerene chemistry for the development of new dendritic materials.



PERSPECTIVES

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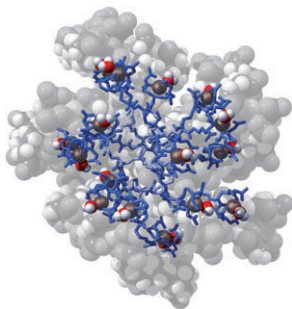


The potential of cycloaddition reactions in the synthesis of dendritic polymers

Brigitte Voit

This review outlines new dendritic architectures which could be prepared only by using highly efficient and selective [4 + 2] Diels–Alder and 1,3-dipolar cycloaddition reactions.

1152

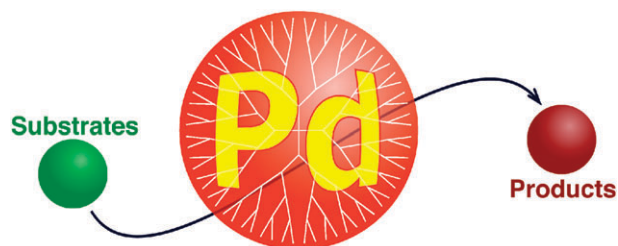


Dendrimers and magnetic resonance imaging

Sander Langereis, Anouk Dirksen, Tilman M. Hackeng, Marcel H. P. van Genderen and E. W. Meijer*

The review describes the potential of dendrimers as multivalent contrast agents for MRI.

1161

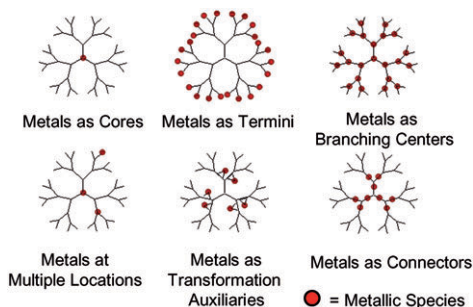


Catalysts based on palladium dendrimers

Román Andrés, Ernesto de Jesús* and Juan Carlos Flores

Dendritic structures have been applied to carbon–carbon bond formation and other palladium-catalysed reactions in different approaches described in this review.

1192



Recent progress and applications for metallodendrimers

Seek-Ho Hwang, Carol D. Shreiner, Charles N. Moorefield and George R. Newkome*

Progress in metallodendritic architectures is discussed as it relates to catalysis, luminescence, sensors, and molecular switches.

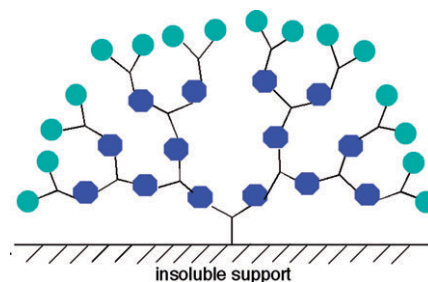
PERSPECTIVES

1218

Dendrons on insoluble supports: synthesis and applications

Tzofit Kehat, Kerem Goren and Moshe Portnoy*

This *perspective* surveys the synthetic schemes leading to various types of the support-bound dendrons and discusses the applications of the formed dendronized supports.



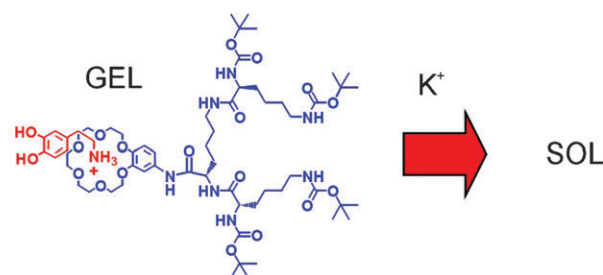
PAPERS

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Crown ether functionalised dendrons—controlled binding and release of dopamine in both solution and gel-phases

Sonia V. Brignell and David K. Smith*

Crown ether functionalised dendrons are able to form nanostructured soft materials which exhibit the triggered release of active ingredients.

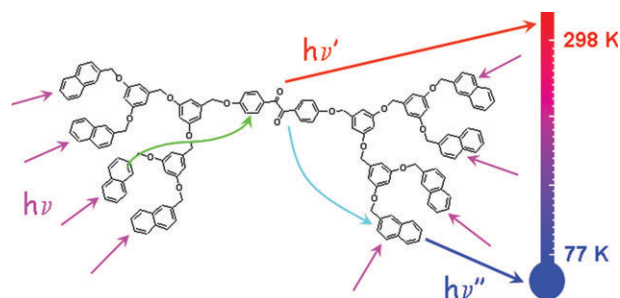


1250

Photophysical, photochemical, and electrochemical properties of dendrimers with a dimethoxybenzil core

Carlo Giansante, Paola Ceroni,* Vincenzo Balzani, Mauro Maestri, Sang-Kyu Lee and Fritz Vögtle*

The lowest emitting excited state of the dendrimer is located on the dimethoxybenzil core at room temperature and on the peripheral naphthyl chromophores in a rigid matrix at 77 K.

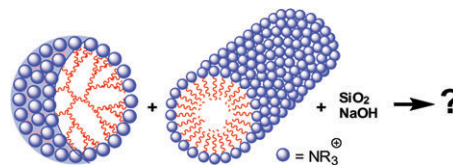


1259

Influence of cationic phosphorus dendrimers on the surfactant-induced synthesis of mesostructured nanoporous silica

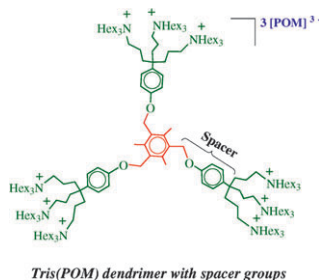
Philippe Reinert, Jean-Yves Chane-Ching,* (The late) Lucy Bull, Rodolphe Dagiral, Patrick Batail, Régis Laurent, Anne-Marie Caminade* and Jean-Pierre Majoral*

The dramatic influence of polycationic dendrimers used together with cationic surfactants for the elaboration of periodic mesoporous silica is described, as well as the properties of these new materials.



PAPERS

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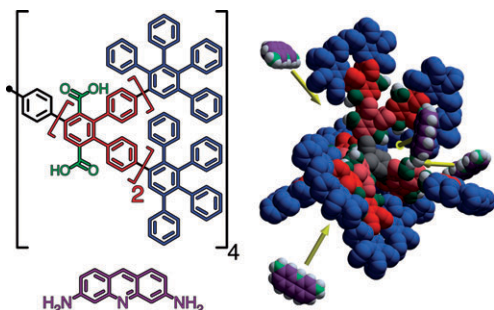


Peripheral functionalisation of dendrimers with polyoxotungstate complexes assembled by ionic bonding and their use as oxidation catalysts: Influence of the tether length

Sylvain Nlate,* Lauriane Plault and Didier Astruc*

Polyoxophosphotungstate trianions stabilized by dendritic counter cations efficiently catalyse the selective oxidation of alkenes, sulfides and alcohols in an aqueous/ CDCl_3 biphasic system using H_2O_2 with dendritic and tether length effects on the yields, stability and re-use of the catalysts.

1275

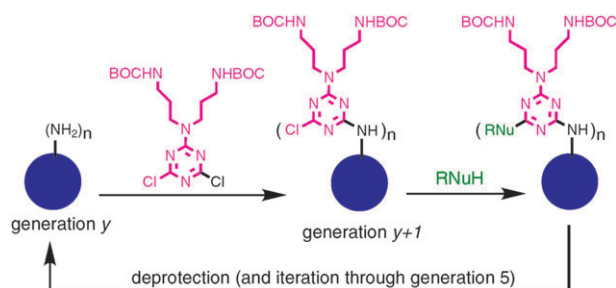


Precision host–guest chemistry of polyphenylene dendrimers

Roland E. Bauer, Christopher G. Clark, Jr. and Klaus Müllen*

A polyphenylene dendrimer was found to complex four equivalents of proflavine hydrochloride dye by precision host–guest chemistry with the carboxylic acids connected to the dendritic backbone.

1283

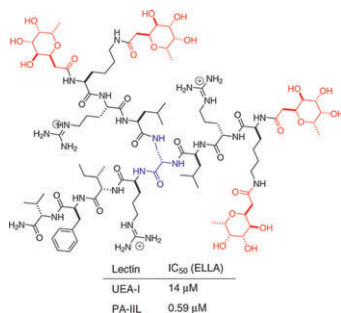


A divergent route towards single-chemical entity triazine dendrimers with opportunities for structural diversity

Hannah Crampton, Emily Hollink, Lisa M. Perez and Eric E. Simanek*

Reaction of a dendrimer core with a dichlorotriazine monomer followed by reaction of the resulting poly(monochlorotriazine) macromolecule can be iterated through generation five.

1291



Combinatorial variation of branching length and multivalency in a large (390 625 member) glycopeptide dendrimer library: ligands for fucose-specific lectins

Emma M. V. Johansson, Elena Kolomiets, Frank Rosenau, Karl-Erich Jaeger, Tamis Darbre and Jean-Louis Reymond*

Library screening led to C-fucosylated peptide dendrimer **K-T1+** with high affinity to the fucose specific lectins *Ulex Europaeus* and LecB (PA-IIL) of the human pathogen *Pseudomonas aeruginosa*.

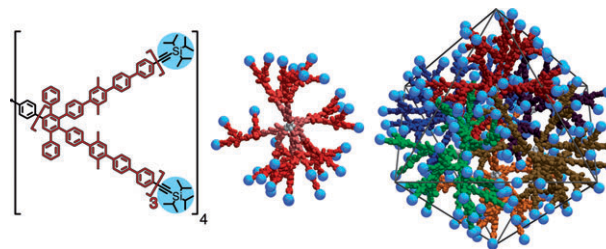
PAPERS

1300

Solvophobically-driven 3-D self-assembly of “exploded”-type polyphenylene dendrimers

Christopher G. Clark, Jr., Ryan J. Wenzel, Ekaterina V. Andreitchenko, Werner Steffen, Renato Zenobi and Klaus Müllen*

A globular, shape-persistent, third-generation “exploded”-type polyphenylene dendrimer was found to assemble predominantly into a hexamer, as elucidated using advances in MALDI-TOF mass spectrometry and dynamic light scattering.

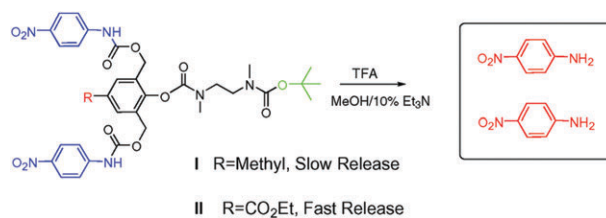


1307

Substituent-dependent disassembly of self-immolative dendrimers

Rotem Perry, Roey J. Amir and Doron Shabat*

The disassembly of self-immolative dendrimers can be control by changing the aromatic substituent of the dendron's building block.

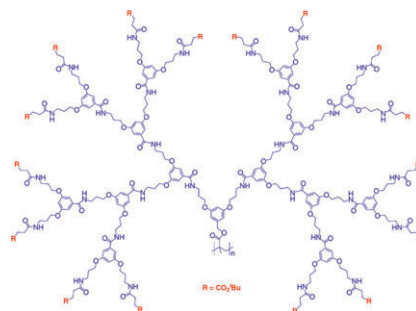


1313

An easy accessible homologous set of first to fifth generation dendritic methacrylic macromonomers and their polymerizations

Edis Kasëmi and A. Dieter Schlüter*

Cheap and easy access to “surface” functionalizable dendronized polymers of up to generation four.

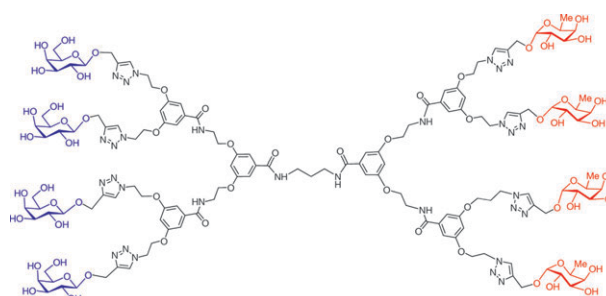


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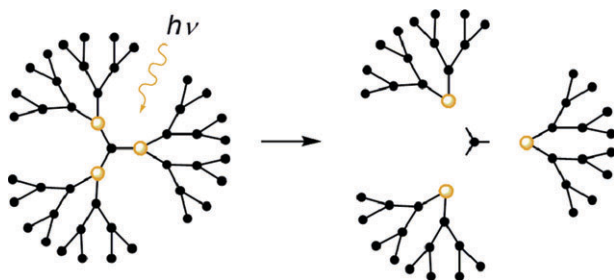
Synthesis of glycodendrimers containing both fucoside and galactoside residues and their binding properties to Pa-IL and PA-III lectins from *Pseudomonas aeruginosa*

Isabelle Deguise, David Lagnoux and René Roy*

Novel and unique glycodendrimers bearing simultaneously D-galactoside and L-fucoside residues were prepared and their relative binding properties to both lectins PA-IL and PA-III from *Pseudomonas aeruginosa* have been evaluated. Glycodendrimers with a minimum of four residues showed best efficiencies in cross-linking the tetrameric lectins



1332

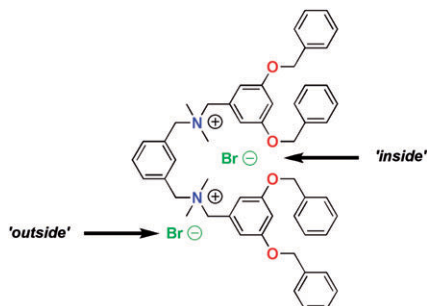


Synthesis and degradation of photolabile dendrimers based on *o*-nitrobenzyl ether photolabile cores

Robert M. Kevwitch and Dominic V. McGrath*

Photolabile dendrimers based on *o*-nitrobenzyl linkages have been prepared to the third generation and shown to undergo efficient photocleavage as monitored by UV, NMR and GPC.

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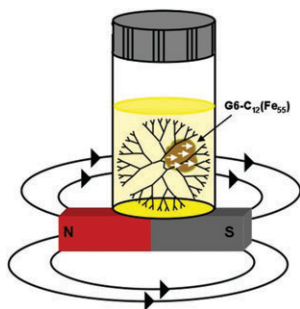


Ionic core-shell dendrimers with a polycationic core: structural aspects and host-guest binding properties

Rob van de Coevering, Pieter C. A. Bruijninx, Martin Lutz, Anthony L. Spek, Gerard van Koten* and Robertus J. M. Klein Gebbink*

Crystallographic analysis of ionic dendritic wedges provides intricate insight in the geometry and mode of anion binding, which aids in the understanding of the anion binding properties of ionic core-shell dendrimers.

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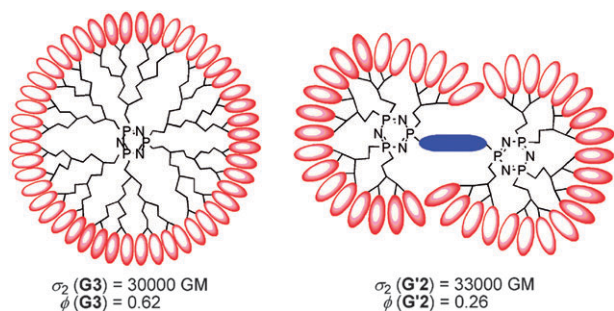


Magnetic properties of dendrimer-encapsulated iron nanoparticles containing an average of 55 and 147 atoms

Marc R. Knecht and Richard M. Crooks*

Dendrimer-encapsulated Fe nanoparticles consisting of 55 and 147 atoms demonstrate size-dependent magnetic properties.

1354



Organic nanodots for multiphotonics: synthesis and photophysical studies

Olivier Mongin, Anna Pla-Quintana, Francesca Terenziani, Delphine Drouin, Céline Le Droumaguet, Anne-Marie Caminade, Jean-Pierre Majoral* and Mireille Blanchard-Desce*

Two series of fluorescent dendrimers of different geometries (spherical-like and dumbbell-like) were designed and their photophysical and two-photon absorption properties are compared.

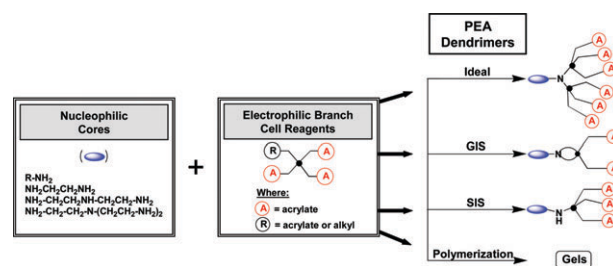


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Unique steric and geometry induced stoichiometries observed in the divergent synthesis of poly(ester-acrylate/amine) (PEA) dendrimers

Douglas R. Swanson, Baohua Huang,
Hosam G. Abdelhady and Donald A. Tomalia*

Dendronization of various amine cores with *unprotected*, branched-(A)₃ or (A)₄-type acrylate monomers produced $G = 1$; acrylate terminated dendrimers in high yield. Depending upon core structure and core/acrylate monomer ratios, dendrimers possessing either ideal stoichiometries, geometrically induced stoichiometries (GIS), sterically induced stoichiometries (SIS) or polymeric gels were obtained.



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