

## 2009 MRL PUBLICATIONS

### IRG 1

#### a. Primary MRSEC Support

B.D. Armstrong, P. Soto, J. **Shea**, S. **Han**, "Overhauser dynamic nuclear polarization and molecular dynamic simulations using pyrroline and piperidine ring nitroxide radicals," *Journal of Magnetic Resonance* **200**(1), 137 (2009)

A.J. Bonham, T. Neumann, M.V. **Tirrell**, N.O. Reich, "Tracking transcription factor complexes on DNA using T.I.R.F. protein binding microarrays," *Nucleic Acids Research* **37**, e94 (2009)

G. Braun, A. Pallaoro, G. Wu, D. Missirlis, J. Zasadzinski, M.V. **Tirrell**, N. Reich, "Laser-activated gene silencing via gold nanoshell-siRNA conjugates," *ACS Nano* **1**, 2007 (2009)

K.E. Feldman, C.J. **Hawker**, E.J. **Kramer**, "Relationship between macroscopic properties and polymer architecture in hydrogen bonded thermoplastic elastomers," *Polymeric Materials: Science and Engineering* **101**, 1149 (2009)

K.E. Feldman, M.J. Kade, E.W. Meijer, C.J. **Hawker**, E.J. **Kramer**, "Model transient networks from strongly hydrogen bonded polymers," *Macromolecules* **42**, 9072 (2009)

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R.S. Hoy, M. Kroger, K. Foteinopoulou, "Topological analysis of polymeric melts: Chain-length effects and fast-converging estimators for entanglement length," *Phys. Rev. E* **80**, article 031803 (2009)

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R. Kausik, A. Srivastava, P.A. Korevaar, G.D. **Stucky**, J.H. **Waite**, S. **Han**, “Local water dynamics in coacervated polyelectrolytes monitored through dynamic nuclear polarization-enhanced  $^1\text{H}$  NMR,” *Macromolecules* **42**(19), 7404 (2009)

T. Neumann, S. Gajria, M.V. **Tirrell**, L. **Jaeger**, “Reversible structural switching of a DNA-DDAB film,” *J. Am. Chem. Soc.* **131**, 3440 (2009)

E.S. Penev, S. Lampoudi, J.-E. **Shea**, “TiReX: Replica-exchange molecular dynamics using TINKER,” *Computer Physics Communications* **180**(10), 2013 (2009)

M.O. Robbins, R.S. Hoy, “Scaling of the strain hardening modulus of glassy polymers with the flow stress,” *J. Polym. Sci Part B - Polym. Phys.* **47**, 1406 (2009)

W. Smitthipong, T. Neumann, S. Gajria, Y. Li, A. Chworos, L. **Jaeger**, M. **Tirrell**, “Noncovalent self-assembling nucleic acid-lipid based materials,” *Biomacromolecules* **10**(2), 221 (2009); DOI: 10.1021/bm800701a

A. Srivastava, J.H. **Waite**, G.D. **Stucky**, A. Mikhailovsky, “Fluorescence investigations into complex coacervation between polyvinylimidazole and sodium alginate,” *Macromolecules* **42**, 2168 (2009)

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S. Garcia, J.H. Walton, B. Armstrong, S. **Han**, M.J. McCarthy, “L-Band Overhauser dynamic nuclear polarization,” *J. Magn. Reson.* **203**(1), 138 (2009)

M. Kanduč, A. Naji, Y.S. Jho, P.A. **Pincus**, R. Podgornik, “The role of multipoles in counterion-mediated interactions between charged surfaces: Strong and weak coupling,” *J. Phys.: Condens. Matter* **21**, 424103 (2009)

P. Karmali, V. Kotamraju, M. Kastantin, M. Black, D. Missirlis, M. **Tirrell**, E. Ruoslahti, “Targeting of albumin-embedded paclitaxel nanoparticles to tumors,” *Nanomedicine: Nanotechnology, Biology, and Medicine* **5**, 73 (2009)

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D. Peters, M. Kastantin, V. Kotamraju, P. Karmali, K. Gujraty, M. **Tirrell**, E. Ruoslahti, “Targeting atherosclerosis using modular, multifunctional micelles,” *PNAS* **106**(24), 9815 (2009)

O.A. **Saleh**, D.B. McIntosh, P.A. **Pincus**, N. Ribeck, “Nonlinear low-force elasticity of single-stranded DNA molecules,” *Phys. Rev. Lett.* **102**, 068301 (2009)

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O. Bierwagen, T. Nagata, T. Ive, C.G. **Van de Walle**, J.S. **Speck**, “Dissipation-factor-based criterion for the validity of carrier-type identification by capacitance-voltage measurements,” *Appl. Phys. Lett.* **94**, 152110 (2009)

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C. Freysoldt, J. Neugebauer, C.G. **Van de Walle**, "Fully *ab initio* finite-size corrections for charged-defect supercell calculations," *Phys. Rev. Lett.* **102**, 016402 (2009)

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J.B. Beck, K.L. Killops, T. Kang, K. Sivanandan, A. Bayles, M.E. Mackay, K.L. Wooley, C.J. **Hawker**, “Facile preparation of nanoparticles by intramolecular cross-linking of isocyanate functionalized copolymers,” *Macromolecules* **42**, 5629 (2009)

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H. Ade, C. Wang, A. Hexemer, A. Garcia, T.-Q. **Nguyen**, G.C. Bazan, K.E. Sohn, E.J. **Kramer**, “Characterization of a multicomponent polymer multilayer,” *J. Polymer Sci. – Polymer Phys.* **47**, 1291 (2009)

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None

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## **PATENTS**

"Nanoparticle assembled hollow spheres"

J. Cha, T.J. Deming, G.D. **Stucky**, M.S. Wong, H. Birkedal, M.H. Bartl, J.L. Summerel  
US Patent 7,563,457 (July 21, 2009)

A design strategy for constructing hierarchically structured materials using nanoparticles and synthetic biopolymers has been developed. Block copolypeptides or homopolymer polyelectrolytes are used as structure-directing agents to arrange nanoparticles (composed of metals, metal non-oxides, metal oxides, or organics) into unusual microstructures, such as spheres, <sup>3</sup>apples<sup>2</sup> and <sup>3</sup>cups. <sup>2</sup> Hollow spheres can be made wherein nanoparticles of one composition are spatially oriented completely interior or exterior to nanoparticles of a second composition. These aggregates contain nanoparticles only in the shell walls, and maintain their hollowness upon calcination. These shapes can also be fabricated into films. These robust materials are anticipated to have great promise in applications that require surface catalysis, magnetic/electronic/optic properties, transport capabilities, and combinations thereof, such as drug delivery, packaging, catalysis, and sensors.

"Hydrogen cyano fullerene containing proton conducting membranes"

F. **Wudl**, G.D. **Stucky**, H. Wang, B. Joussemme, K. Tasaki, A. Venkatesan  
US Patent 7,588,824 (September 15, 2009)

The components of and a proton conducting membrane (PCM) produced from a host polymer and an attached or physically blended in hydrogen cyano fullerene proton-source agent, with the physical blending of the host polymer and hydrogen cyano fullerene further promoted by a poly(ethylene oxide) attached fullerene mixing agent.



