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1. Main Research Results

- 1) High thermal conductive epoxy resins: Epoxy resins that contained liquid crystalline function were synthesized. Thermal conductivity of the resulting resin was about three times higher than the usual epoxy resins.
- 2) Preparation of block copolymers aiming nanofabrication for LSI devices: Block copolymers containing silan unit were prepared and the structure was clarified in detail. The goal of this project is to establish 10 nm level fabrication using self assembly in the block copolymers.
- 3) Oxidation of alcohols using carbon alloy catalysts: Benzaldehyde was selectively obtained from benzyl alcohol by aerobic oxidation in the presence of carbon alloy catalysts and nitric acid.

2. List of Publication

- 1) Double liquid crystalline side-chain type block copolymers for hierarchically ordered nanostructures: Synthesis and morphologies in the bulk and thin film
Rina Maeda, Teruaki Hayakawa, Masatoshi Tokita, Ryohei Kikuchi, Jun Kouki, Masa-aki Kakimoto, Hiroaki Urushibata
Reactive & Functional Polymers 69, 519–529 (2009)
- 2) Hyperbranched polysiloxysilane nanoparticles: Surface charge control of nonviral gene delivery vectors and nanoprobe
Won Jin Kim^{a,b}, Adela C. Bonoiua, Teruaki Hayakawa^c, Cheng Xia^c, Masa-aki Kakimoto^c, Haridas E. Pudavar^a, Kwang-Sup Lee^{a,b,*}, Paras N. Prasad^{a,**}
a Institute for Lasers, Photonics, and Biophotonics, University at Buffalo, The State University of New York, Buffalo, NY 14260-3000, USA
b Department of Advanced Materials, Hannam University, Daejeon 305-811, Republic of Korea
c Department of Organic and Polymeric Materials, Tokyo Institute of Technology, Tokyo 152-8552, Japan
International Journal of Pharmaceutics 376 (2009) 141–152
- 3) Preparation and characterization of hyperbranched poly(ether sulfone)s with imidazolium salts at termini

Takashi Ohsugi, Teruaki Hayakawa, and Masa-aki Kakimoto
J. Photopolym. Sci. Tech., 22, 441-445 (2009)

- 4) One-step direct-patternig template utilizing self-assembly of POSS-containing block copolymers

Tomoyasu Hirai, Melvina Leolukman, Chi Chun Liu, Eungnak Han, Yun Jun Kim, Yoshihito Ishida, Teruaki Hayakawa, Masa-aki Kakimoto, Paul F. Nealey, and Padma Gopalan

Adv. Mater., 2009, 21, 4334-4338

- 5) Hierarchical self-assembled structures from POSS-containing block copolymers synthesized by living anionic polymerization

Macromolecules, 42, 8835 (2009)

- 6) Carbon Nitride as a Nonprecious Catalyst for Electrochemical Oxygen Reduction

Stephen M. Lyth, Yuta Nabaе, Shogo Moriya, Shigeki Kuroki, Masa-aki Kakimoto, Jun-ichi Ozaki, and Seizo Miyata

J. Phys. Chem. C, 113, No. 47, 20148-20151 (2009)