

Bon-Cheol Ku

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Objective

A research and development position in the organic/inorganic materials chemistry institute/industry requiring expertise in synthetic and applied polymer chemistry.

Highlights

- Extensive industrial and academic experience in polymer synthesis and applications
- Design and development of novel functional polymers and composites for the preparation of biodegradable polymers, electrically conducting polymers and halogen-free fire-safe polymers
- Halogen-free anti-flammable polymers cited in several leading magazines, including Materials World (July 2007) and Business Week (June 2007)

Education

- Ph.D. Polymer Science/Plastics Engineering, University of Massachusetts, Lowell, MA 2005
Thesis title: "Synthesis and Applications of Electrically Conducting Polymer Nanocomposites"
Advisor: Professor Jayant Kumar, Co-advisor: Dr. Lynne A. Samuelson (US Army Natick Center)
- M.S. Bioorganic Chemistry, Pohang University of Science and Technology, Korea 1994
- B.S. Chemistry, Sogang University, Korea 1992

Research Experience

Post-doctoral Research Associate, University of Massachusetts, Amherst, MA 005 – Present
Advisor: Professor E. Bryan Coughlin

- Synthesized high molecular weight deoxybenzoin-based polyarylates, polyphosphonates, and poly(arylate-co-phosphonate)s that exhibit ultra fire-resistant behavior with low heat release capacity and high char yields, thus yielding fire-safe properties with minimum smoke.
- Developed novel deoxybenzoin-based vinyl monomers for the synthesis of flame-retarding polystyrene (PS) and polymethylmethacrylate (PMMA) derivatives.
- Designed and synthesized polyhedral oligomeric silsesquioxane (POSS) containing monomers for the development of thermally stable and low dielectric Poly(*p*-phenylene sulfide) nano-materials.

Doctoral Research, University of Massachusetts, Lowell, MA 2000 – 2005
Advisor: Professor Jayant Kumar, Co-advisor: Dr. Lynne A. Samuelson

- Synthesized electrically conducting polymers and polymer nanocomposites using both enzyme and biomimetic catalysts.
- Fabricated polymer-clay nanocomposites by using layer-by-layer assembly technique for the development of ultrahydrophobic (22 times) or ultra oxygen (3 orders) barrier membranes.
- Synthesized highly water soluble conducting polymer-carbon nanotube (SWNT) composites.

Research Scientist, SK Chemicals Co., Ltd., Korea 1994 – 2000

- Designed and developed low cost and low melting non woven synthetic fibers consisting of bicomponents polyesters (PET/PET copolymers, SKYVIVA[®]) and polyolefins (PP/PE).
- Conducted synthesis and application evaluations of biodegradable aliphatic polyesters (SKYGREEN[®]).
- Conducted large scale synthesis of cis-Platin based anti-cancer drug (SUNPLA[®]).

Honor and Awards

Outstanding Graduate Student Award at University of Massachusetts Lowell	2005
Tripathy Memorial Graduate Fellowship Award at University of Massachusetts Lowell	2004
President of Korean Graduate Student Association at University of Massachusetts Lowell	2004
Trade & Industry Minister Award for an Excellent Patent in Korea	1997

Professional Affiliations

Sigma Xi, American Chemical Society, Materials Research Society

Patents

1. "Fire-resistant polyolefin compositions containing deoxybenzoin pendant groups" T. Emrick, E. B. Coughlin, B.-C. Ku, T. Ranganathan, R. J. Farris. *U.S. Patent* submitted
2. "Fire-resistant polymer compositions containing deoxybenzoin in the backbone" T. Emrick, T. Ranganathan, B.-C. Ku, E. B., Coughlin, R. J. Farris. *U.S. Patent* submitted
3. "Polymerization of Aromatic Monomers Using Derivatives of Hematin" S. K. Tripathy, L. A. Samuelson, F. Bruno, S. Roy, R. Nagarajan, J. Kumar, B.-C. Ku, S.-H. Lee, *U.S. Patent* No. US 2002183470, **2002**
4. "Pin-Shaped Pesticide Formulation" K.-S. Oh, S.-S. Park, B.-Y. Oh, J.H. Kim, S.K. Kim, B.-C. Ku, K.-S. Yoon, H.G. Kim, *Korean Patent* 10-0329434-0000, **2002**
5. "The Composition of Controlled-release Water Treatment Using Biodegradable Aliphatic Polyester S. J. Han, J.-J. Shin, J. W. Park, J. M. Ha, K.-S. Yoon, B.-C. Ku, H.G. Kim, *Korean Patent* 10-0325121, **2002**
6. "Biodegradable Controlled-release Insecticide Formulation" H.-Y. Kim, K.-S. Yoon, B.-C. Ku, S.H. Baek, B.-Y. Oh, S.-S. Park, Y.-K. Kim, K.-S. Oh, *European Patent* 843963, **1998**

Publications

1. "BHDB-based Polyarylates: Synthesis, Thermal and Mechanical Properties" B.-C. Ku, J. Wu, M. Beaulieu, T. Ranganathan, R. J. Farris, T. Emrick, A. J. Lesser, E. B. Coughlin, *in preparation*
2. "An Environmentally-friendly Non-halogenated Approach for Reducing Flammability of Polycarbonates", T. Ranganathan, T. Filipova, B.-C. Ku, M. Beaulieu, D. A. Boyles, E.B. Coughlin T. Emrick, *in preparation*
3. "Electrospun Polymer Nanofibers Containing Deoxybenzoin-based Polyphosphonate: Preparation, Mechanical and Flammability Properties" S. C. Moon, B.-C. Ku, T. Emrick, E. B. Coughlin, R. J. Farris, *J. Appl. Polym. Sci.* submitted
4. "Poly(arylate-phosphonate) copolymers with deoxybenzoin in the backbone: Synthesis, characterization, and thermal properties" T. Ranganathan, B.-C. Ku, J. Zilberman, M. Beaulieu, R. J. Farris, E. B. Coughlin, T. Emrick, *J. Polym. Sci. Part A: Polym. Chem.* **2007**, 45(20), 4573-4580

5. "Molecularly Ordered Structure and Permeability Properties of Amphiphilic Polyacetylene-Multilayer Nanocomposites" B.-C. Ku, D. W. Kim, D. Steeves, R. Nagarajan, A. Blumstein, J. Kumar, P. W. Gibson, J. A. Ratto, L. A. Samuelson, *Compos. Sci. Technol.* Submitted
6. "Synthesis and Properties of Water Soluble Single-Walled Carbon Nanotube Graft Ionic Polyacetylene Nanocomposites" B.-C. Ku, D. K. Kim, J. S. Lee, A. Blumstein, J. Kumar, L. A. Samuelson, *Polym. Composite* submitted
7. "Hydrophobic Barrier: Molecular Self-Assembly of Amphiphilic Polyacetylenes on Aluminosilicate Nanoplatelets" D. W. Kim, B.-C. Ku, D. Steeves, R. Nagarajan, A. Blumstein, J. Kumar, P.W. Gibson, J. A. Ratto, L. A. Samuelson, *J. Membr. Sci.* **2006**, 275, 12-16.
8. "Barrier Properties of Ordered Multilayer Polymer Nanocomposites" B.-C. Ku, A. Blumstein, L. A. Samuelson, J. Kumar, D.W. Kim, In *Encyclopedia of Nanoscience and Nanotechnology*, Marcel Dekker, New York, **2004**, 1, 213-225.
9. "Electrostatic Assembly of Conjugated Polymer Thin Layers on Electrospun Nanofibrous Membranes for Biosensors" X. Wang, Y.-G. Kim, C. Drew, B.-C. Ku, J. Kumar, and L.A. Samuelson, *Nano Lett.* **2004**, 4, 331-334.
10. "Cross-linked Multilayer Polymer-Clay Nanocomposites and Permeability Properties" B.-C. Ku, D. Froio, D. Steeves, D. W. Kim, H. Ahn, J. A. Ratto, A. Blumstein, J.Kumar, L. A. Samuelson, *J. Macromol. Sci. Pure Appl. Chem.* **2004**, 41(12), 1401-1410
11. "A New Approach to Catalyze Template Polymerization of Aniline Using Electrostatically Multilayered Hematin Assemblies" B.-C. Ku, S.-H. Lee, W. Liu, F. F. Bruno, J.-A. He, J. Kumar, L. A. Samuelson, *J. Macromol. Sci. Pure Appl. Chem.* **2003**, A40, 1335-1346.
12. "Synthesis and Electrospinning of a Novel Fluorescent Polymer PMMA-PM for Quenching-Based Optical Sensing" X. Wang, S.-H. Lee, B.-C. Ku, L. A. Samuelson, J. Kumar, *J. Macromol. Sci. Pure Appl. Chem.* **2002**, 39, 1241-1249.
13. "The Efficient Resolution of Protected Diols and Hydroxy Aldehydes by Lipases" M.-J. Kim, I. T. Lim, G.-B. Choi, S.-Y. Whang, B.-C. Ku, J.-Y. Choi, *Bioorg. & Med. Chem. Lett.*, **1996**, 6, 71-76.

Non-refereed Publications

1. "Synthesis of Water-Soluble Single-Walled Carbon Nanotube-Polyacetylene Nanocomposites" B.-C. Ku, D. K. Kim, J. Lee, A. Blumstein, J. Kumar, L. A. Samuelson, *Polymer Preprint*, **2006**, 47(1), 468.
2. "Characterization and application of amphiphilic polyacetylenes in methanol/water mixture" B.-C. Ku, K. Yang, D. W. Kim, A. Blumstein, L. A. Samuelson, J. Kumar, *Polymer Preprint*, **2004**, 45(2), 233
3. "Electrostatic Layer-by-Layer Assembly of Polyelectrolytes on Surface Functionalized Electrospun Nanofibers and Metal Oxide Deposition" C. Drew, F. F. Bruno, X. Wang, B.-C. Ku, L. A. Samuelson, J. Kumar, *Polymeric Materials Science and Engineering*, **2004**, 91, 945

4. "Self-Assembled Amphiphilic Conjugated Polymers on Aluminosilicate Nanoparticles as Barrier Membranes" B.-C. Ku, M.-H. Chen, R. Nagarajan, J. Yun, A. Blumstein, J. Kumar, D.W. Kim, D. Steeves, J.A. Ratto, L.A. Samuelson, *Polymer Nanocomposites*, Quebec, Canada, **2003**
5. "Electrostatic Assembly of Titanium Dioxide on Surface Functionalized Electrospun Nanofibers" C. Drew, B.-C. Ku, X.Wang, L. A. Samuelson, J. Kumar, *Polymer Preprint*, **2003**, 44(2), 111.
6. "Biochemical Sensor via Combination of Electrospinning with Electrostatic Layer-by-Layer Assembly" X. Wang, Y.-G. Kim, C. Drew, B.-C. Ku, J. Kumar, L. A. Samuelson. *Polymeric Materials Science and Engineering*, **2003**, 88, 35-36.
7. "Synthesis of Polyaniline Using Electrostatically Layered Hematin Assemblies" B.-C. Ku, S.-H. Lee, W. Liu, J. Kumar, F.F. Bruno, L. A. Samuelson, *Materials Research Society Symposium Proceedings*, **2002**, 708, 311-316.
8. "Design, Synthesis and Electrospinning of a Novel Fluorescent Polymer for Optical Sensor Applications" S.-H. Lee, B.-C. Ku, X. Wang, L. A. Samuelson, J. Kumar, *Materials Research Society Symposium Proceedings*, **2002**, 708, 403-408.
9. "Physicochemical Properties and Control Effect of a Pin Formulation for Controlled Release Using Biodegradable Materials as a Matrix" K.-S. Oh, B.-Y. Oh, J.-H. Kim, S.-S. Park, B.-C. Ku, S.-K. Kim, BCPC Conference-Pests & Diseases, **2000**, 3, 1075-1080.
10. "The Study of Biodegradable and Compatible Effect of Short Chain Branching in LLDPE on the Blown Film Properties of Linear Low Density Polyethylene (LLDPE) and Aliphatic Polyester Blend" B.-C. Ku, K.-S. Yoon, H.-J. Park, *The Polymer Society of Korea*, **1997**

Presentations

1. S.C. Moon, B.-C. Ku, T. Emrick, E. B. Coughlin, R. J. Farris, Ultra Flame Resistant Electrospun Polymer Nanofibers Containing Halogen-Free 4,4'-Bishydroxydeoxybenzoin, MRS, Boston, MA, **2007**
2. B.-C. Ku, D. K. Kim, J. Lee, A. Blumstein, J. Kumar, L. A. Samuelson, Synthesis of Water-Soluble Single-Walled Carbon Nanotube-Polyacetylene Nanocomposites, ACS, Atlanta, GA March 26-30, **2006**
3. B.-C. Ku, K. Yang, D. W. Kim, A. Blumstein, L. A. Samuelson, J. Kumar, Characterization and application of amphiphilic polyacetylenes in methanol/water mixture, ACS, Philadelphia, PA, **2004**.
4. B.-C. Ku, D.W. Kim, D. Steeves, A. Blumstein, J. Kumar, L.A. Samuelson, Ordered Multilayer Polyacetylene-aluminosilicate Nanocomposites. ACS, Anaheim, CA, **2004**.
5. B.-C. Ku, D. Froio, J. A. Ratto, D. Steeves, D. W.Kim, A. Blumstein, J. Kumar, L.A. Samuelson, Cross-linked Polymer-layered Silicate Nanocomposites and Their Oxygen Barrier Properties, ACS, New Orleans, LA, **2003**
6. B.-C. Ku, D. W. Kim, A. Blumstein, J. Kumar, L. A. Samuelson, Self-Assembly of Amphiphilic Polyacetylenes on Multi-Walled Carbon Nanotubes, MRS, Boston, **2003**

7. B.-C. Ku, M.-H. Chen, R. Nagarajan, J. Yun, A. Blumstein, J. Kumar, D. W. Kim, D. Steeves, J. A. Ratto, L. A. Samuelson, Self-Assembled Amphiphilic Conjugated Polymers on Aluminosilicate Nanoparticles as Barrier Membranes, Polymer Nanocomposites, Quebec, Canada, **2003**
8. B.-C. Ku, D. W. Kim, A. Blumstein; J. Kumar; D. Steeves; P.W. Gibson; L. A. Samuelson, Cross-linked Electrostatically Layered Aluminosilicate Nanocomposites and Barrier Properties, ACS, Boston, MA, **2002**
9. B.-C. Ku, D. W. Kim, A. Blumstein, J. Kumar, D. Steeves, P.W. Gibson, L. A. Samuelson, Barrier Properties of Electrostatic Layer-by-Layer Ordered Multilayer Nanocomposites of Substituted Ionic Polyacetylenes and Aluminosilicate Nanoplatelets, ACS, Boston, MA, **2002**
10. B.-C. Ku, S.-H. Lee, W. Liu, J. Kumar, F. F. Bruno, L. A. Samuelson, Synthesis of Polyaniline Using Electrostatically Layered Hematin Assemblies, MRS, Boston, **2001**
11. D. Steeves, B.-C. Ku, D. Froio, J. A. Ratto, L. A. Samuelson, A. Blumstein, J. Kumar, Greatly enhanced gas barrier properties of poly(ethylene terephthalate) films achieved using electrostatic multilayer deposition techniques, ACS Washington D.C. PA, **2005**
12. X. Wang, Y.-G. Kim, C. Drew, B.-C. Ku, J. Kumar, L.A. Samuelson, Biochemical Sensor via Combination of Electrospinning with Electrostatic layer-by-layer assembly, ACS, New Orleans, LA, **2003**
13. X. Wang, Y.-G. Kim, C. Drew, B.-C. Ku, J. Kumar, L.A. Samuelson, Nanostructured Sensing Surfaces via Combination of Electrospinning with Electrostatic Layer-by-layer Assembly, ECS, France, **2003**
14. X. Wang, Y.-G. Kim, C. Drew, B.-C. Ku, J. Kumar, L. A. Samuelson, Highly Efficient Sensors Based on Self-Assembled Conjugated Polymer Layer on Electrospun Nanofibrous Membranes, MRS, Boston, **2002**
15. S.-H. Lee, B.-C. Ku, X. Wang, L. A. Samuelson, J. Kumar, Design, Synthesis and Electrospinning of a Novel Fluorescent Polymer for Optical Sensor Applications, MRS, Boston, **2001**

References

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