

LIBO WU

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Education

Ph.D. Chemical Engineering Wayne State University (**GPA: 4.0/4.0**) Advisor: Sandro da Rocha Fall, 2008
Dissertation: "*Novel Propellant-Driven Formulations for the Systemic Delivery of Biomolecules to and through the Lungs*"
M.E. Polymer Engineering, Beijing University of Chemical Technology, China 2003
Thesis: "*Preparation, Characterization and Properties Study of Polypropylene/Clay nanocomposites*"
B.E. Polymer Engineering, Beijing University of Chemical Technology, China 2000

Professional Experience

- WAYNE STATE UNIV— Research Assistant** 2004-Present
- ✓ Surface modification by silane self-assembly; Analysis of silane monolayer by AFM, XPS, Ellipsometry and Contact Angle Goniometry; Investigated solvation of various moieties in hydrofluoroalkane (HFA) using CFM.
 - ✓ Synthesis of biodegradable polylactide and polycaprolactone containing block copolymer excipients to stabilize water-HFA emulsion and to stabilize the colloidal suspensions in HFA for various drugs; Characterization of the copolymers by NMR, GPC, FTIR; Investigated the effect of various excipients on the drug particles interaction in HFA by CPM; In collaboration with MAP Pharmaceuticals Inc to investigate the interactions between budesonide and formoterol particles in HFA by AFM.
 - ✓ Engineering of pMDI-based pharmaceutical particles with excellent colloidal suspension stability in HFA and aerosol performance: Core-Shell Particles, PEG-coated Particles, Porous Particles; Particles morphology study by AFM, SEM, TEM, XRD and DLS; Particles composition analysis by HPLC, NMR and FTIR; Investigated drug particles interaction by CPM; Aerosol characterization by ACl and laser diffraction, drug quantification by UV-vis and HPLC; Protein analysis by BCA assay and HPLC.
- TSINGHUA UNIS INSIGHT CHEMICAL INC, China—R & D Department, Research Scientist** 2003-2004
- ✓ Synthesis of UV-curing urethane acrylate oligomer for leather coating; Formulation development for UV-curing printing ink; Formulation optimization by Design of experiments; Transition formulation process from R & D into plants.
- BEIJING UNIV. OF CHEM. TECH., China—Department of Polymer Science & Engineering** 2000-2003
- Polypropylene/Clay Nanocomposite***
- ✓ Clay modification and intercalation, characterization by XRD and TGA; Preparation of PP/clay nanocomposite by melt extrusion; Studies on crystallization kinetics and morphologies of PP/clay nanocomposite by DSC, TEM, XRD; Sample preparation by injection molding and mechanical properties test.
- LLDPE/Silica Nanocomposite***
- ✓ Nano-silica modification with various silanes, characterization by FTIR and TEM; Preparation of LLDPE/silica nanocomposite by reactive melt extrusion, morphology analysis by TEM; Dynamic mechanical properties test by DMA; Rheological and optical properties investigation.
- PVC/ACR/CaCO₃ Nanocomposite***
- ✓ Synthesis of core-shell structured plastic impact modifier by emulsion polymerization, and incorporation into PVC by two-roller mixing and compression molding; Impact strength test and failure analysis by SEM.

Teaching Experience

Aug, 2004 – May, 2005 **Graduate Teaching Assistant** for BE1300 & BE1310
May, 2005 – Aug, 2005 **Graduate Teaching Assistant** for BE1300 & BE1310
May, 2006 – Aug, 2006 **Graduate Teaching Assistant** for BE1300 & BE1310
Aug, 2006 – May, 2007 **Graduate Teaching Assistant** for CHE3220 & CHE3820
May, 2007 – Aug, 2007 **Graduate Teaching Assistant** for BE1300 & BE1310
Aug, 2007 – Present **Graduate Teaching Assistant** for BE1300 & BE1310

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CHE/MSE Wayne State University

Page 1 of 4

Publications

Journal Articles

1. **Wu Libo**; Hua Youqing; Huang Yuqiang. "Studies on the toughening of PVC by means of ACR and nano-CaCO₃" *Journal of Beijing University of Chemical Technology* 2001, 02
2. Huang Yuqiang; Jiang Shengling; **Wu Libo**; Hua Youqing. "Characterization of LLDPE/nano-SiO₂ composites by solid-state dynamic mechanical spectroscopy" *Polymer Testing* 2004, 23(1)
3. **Wu Libo**; Hua Youqing. "Nonisothermal crystallization kinetics of Polypropylene/Clay nanocomposites" *Journal of Beijing University of Chemical Technology* 2003, 02
4. **Wu, Libo**; Hua, Youqing. "Polypropylene nanocomposites filled with novel co-intercalated clay" *PMSE Preprints* (2003), 89: 605-607
5. Hua, Y.; Zhang, Y.; **Wu, L.**; Huang, Y.; Wang, G. "Mechanical and optical properties of polyethylene filled with nano-SiO₂" *Journal of Macromolecular Science, Physics* 2005, B44(2), 149-159.
6. **Wu, L**; da Rocha, S. R. P. et al. "Understanding Solvation in Hydrofluoroalkanes: *Ab initio* Calculations and Chemical Force Microscopy. *Journal of Physical Chemistry B*. 2007, 111(28), 8096-8104.
7. Peguin, R.; **Wu, L.**; da Rocha, S. R. P. "The Ester Group: How Hydrofluoroalkane-philic is it?" *Langmuir* 2007, 23(16). 8291-8294.
8. **Wu, L** and da Rocha, S. R. P., "Biocompatible and Biodegradable Copolymer Stabilizers for Hydrofluoroalkane Dispersions: A Colloidal Probe Microscopy Investigation". 2007, *Langmuir*. 23(24), 12104-12110.
9. **Wu, L** and da Rocha, S. R. P. et al., "Novel Propellant-driven Inhalation Formulations: Engineering Polar Drug Particles with Surface-trapped Hydrofluoroalkane-philic". 2008. *European Journal of Pharmaceutical Science*. 33(2):146-58.
10. **Wu, L**; da Rocha, S. R. P. et al., "Novel Propellant-driven Core-Shell Formulations for the Delivery of Polar Drugs through Pulmonary Route". 2008, *Pharmaceutical Research*. 25(2), 289-301.
11. Bharatwaj S; **Wu, L**; da Rocha, S.R.P. "Biocompatible, lactide-based surfactants for the CO₂-Water interface: high-pressure contact angle goniometry, tensiometry, and emulsion formation", 2007. 23: 12071-12078.
12. Shakya, Rajendra; Hindo, Sarmad; **Wu, Libo**; Ni, Suolong.; Allard, Marco; Heeg, M.Jane; da Rocha, Sandro R.P.; Yee, Gordon T.; Hratchian, Hrant P.; Verani, Claudio N. "Amphiphilic and Magnetic Properties of a New Class of Cluster-bearing [L₂Cu₄(μ₄-O)(μ₂-carboxylato)₄] Soft Materials" *Chemistry, A European Journal*, 2007, 13:9948-9956
13. Shakya, Rajendra; Hindo, Sarmad; **Wu, Libo**; Allard, Marco; Heeg, M. Jane; Hratchian, Hrant P.; McGarvey, Bruce R.; da Rocha, Sandro; Verani, Claudio N. "Archetypical Modeling and Amphiphilic Behavior of Cobalt(II)-containing Soft-Materials with Asymmetric Tridentate Ligands" *Inorganic Chemistry*, 2007, 46: 9808-9818.
14. Parthiban Selvam, Udayan Chokshi, Ayanna Gouch, **Libo Wu**, Lionel Porcar and Sandro R. P. da Rocha "Ethoxylated copolymer surfactants for the HFA134a–water interface: interfacial activity, aggregate microstructure and biomolecule uptake" *Soft Matter*, 2008, 4:357 - 366.
15. **Wu, L** and da Rocha, S.R.P, "Novel porous particle formulations for pulmonary drug delivery using pMDIs". 2008 (To be submitted)
16. **Wu, L** and da Rocha, S.R.P, "Applications of the Atomic Force Microscope in the Development of Propellant-based Inhalation Formulations" 2008 (To be submitted)
17. **Wu, L** and da Rocha, S.R.P, "Stabilization of particles suspension in pressurized hydrofluoroalkane by a novel methodology". 2008 (To be submitted)

Book chapter

"Molecular Scale Behavior in Alternative Propellant-Based Inhaler Formulations." **Wu, L.**; Peguin, R. P. S.; Selvam, P.; Chokshi, U.; da Rocha, S. R. P. In: *Inhalation Aerosols: Physical and Biological Basis for Therapy*; by Hickey, A. J., 3rd Edition. 2007. Informa. 373-397

Patents

1. **Wu, L** and da Rocha, S. R. P., "Method for engineering polar drug particles with surface-trapped Hydrofluoroalkane -philes"
2. **Wu, L** and da Rocha, S. R. P., "Method for engineering porous particles for aerosol formulations for pulmonary drug delivery"
3. **Wu, L** and da Rocha, S. R. P., "Biocompatible and biodegradable copolymer stabilizers for hydrofluoroalkane dispersion"

Conference Presentations

1. **Libo Wu**, Sandro R. P. da Rocha "Engineering Polar Drug Particles With Surface-Trapped Hydrofluoroalkane -Philes For Pressurized Metered-Dose Inhaler Formulations" 2007, **AICHe National Meeting**, Salt Lake City, UT.
2. **Libo Wu**, Robson P. S. Peguin, Sandro R. P. da Rocha "Chemical Force Microscopy And Ab Initio Calculations: A Molecular Approach For The Design Of Hfa-Philes For Pressurized Metered-Dose Inhalers" 2007, **AICHe National Meeting**, Salt Lake City, UT.
3. **Libo Wu**, Sandro R. P. da Rocha "Biocompatible Surfactants for Dispersion-Based Pressurized Metered-Dose Inhalers: A Colloidal Probe Microscopy Investigation" 2007, **AICHe National Meeting**, Salt Lake City, UT.
4. Balaji S. Bharatwaj, **Libo Wu**, Sandro R. P. da Rocha, "Novel Propellant-Driven Formulations For The Pulmonary Delivery Of Biomolecules: Particle Engineering, Aerosol Characteristics And In Vitro Toxicity" 2007, **AICHe National Meeting**, Salt Lake City, UT.
5. Parthiban Selvam, Udayan Chokshi, **Libo Wu**, Sandro R. P. da Rocha "Aqueous Dispersions in Hydrofluoroalkane Propellants for the Pulmonary Delivery of Polar Drugs Including Biomolecules" 2007, **AICHe National Meeting**, Salt Lake City, UT.
6. **Wu, L.**, da Rocha, S.R.P. "Lactide-Based Stabilizers for Pressurized Metered-Dose Inhalers: A colloidal Probe Microscopy Investigation" 2007, **AAPS Annual Meeting**, San Diego, CA
7. **Wu, L.**, Bharatwaj, B, da Rocha, S.R.P. "Novel Propellant-driven Core-Shell Formulations for the Delivery of Small Polar Drugs and Biomolecules through the Pulmonary Route" 2007, **AAPS Annual Meeting**, San Diego, CA
8. Selvam, P.; **Wu, L.**; Peguin, R.S.; Porcar, L.; da Rocha, S.R.P. "Pressurized Mtered-Dose Inhaler Formulationsnf or the Systemic Delivery of Biomolecules" 2006, **AICHe National Meeting** , San Francisco, CA.
9. Selvam, P.; Chokshi, U.; **Wu, L.**; da Rocha, S.R.P. "Biocompatible Surfactants for the Hydrofluoroalkane|Water Interface" 2006, **AICHe National Meeting** , San Francisco, CA.
10. da Rocha, S.R.P., Chokshi, U.; Peguin, R.S.; Selvam, P.; **Wu, L.** "A Molecular Approach for the Development of Hydrofluoroalkane-Based Pressurized Metered-Dose Inhaler Formulations" 2006, **AICHe National Meeting**, San Francisco , CA
11. **Wu, L.**; Al-Haydari, M.; da Rocha, S.R.P. "Core-Shell Nanoparticles: Novel Formulations or the Systemic Delivery of Biomolecules to and Through the Lungs" 2006, **AICHe National Meeting**, San Francisco , CA
12. **Wu, L.**; Al-Haydari, M.; da Rocha, S.R.P. "Developing Novel Inhalation Formulations: a Microscopic Approach" 2006, **AICHe National Meeting**, San Francisco , CA
13. **Wu, L.**, da Rocha, S.R.P. "Biocompatible Surfactants for Dispersion-Based Pressurized Metered-Dose Inhalers" 2006, **AICHe National Meeting**, San Francisco, CA
14. Peguin, R.S.,**Wu, L.** da Rocha, S.R.P. "Chemical Force Microscopy and Ab Initio Calculations: A Molecular Approach for the Design of Surfactants for Pressurized Metered-Dose Inhalers" 2006, **AICHe National Meeting** (01A19), San Francisco , CA
15. Bharatwaj, B.; **Wu, L.**; da Rocha, S.R.P. "Quantification of the Interaction Energy Between CO₂ and CO₂-Philes Using in Situ High-Pressure Goniometry and Tensiometry" 2006, **AICHe National Meeting**, San Francisco, CA
16. Bharatwaj, B.; **Wu, L.**; da Rocha, S.R.P. "High-Pressure Contact Angle Goniometry and Pendant Drop Tensiometry for the Design of Surfactants for the CO₂-Water Interface" 2006, **AICHe National Meeting**, San Francisco, CA
17. Peguin, R.S. **Wu, L.**; da Rocha, S.R.P. "Microscopic Approach for the Design of Surfactants for pMDI-based Formulations: Ab Initio Calculations and Chemical Force Microscopy" 2005, **AICHe National Meeting**, Cincinnati , OH
18. Bharatwaj, B.; **Wu, L.**; da Rocha, S.R.P. " Novel Surfactants with Biodegradable Tails for the C02-Water Interface" 2005,

AICHE National Meeting, Cincinnati, OH

19. Wu, L.; da Rocha, S.R.P. "Surfactant Design for Hydrofluoroalkane-based pMDIs: A Microscopic Investigation Using Chemical Force Microscopy" 2005, **AICHE National Meeting**, Cincinnati , OH .