

## **FACULTY RESEARCH: PATENTS, PRESENTATIONS & PUBLICATIONS**

The School of Packaging engages in a variety of research activities, supported by funds from government, industry, and other organizations. Much of this research is reflected in the research areas discussed in the section on the graduate programs, and in the listing of theses and dissertations. An additional overview of research is presented in this section.

Funding for research and testing comes from a variety of companies and agencies, as illustrated in the following listing:

### **List of Companies and Agencies that Provided Research Funding and Technical Support Funding to the Faculty of the School of Packaging (2000-2009)**

#### **COMPANIES**

Abbott	Johnson & Johnson
Access Business Group	Johnsonville foods
Astra Zeneca	Kellogg Company
Atlanta Nisseki Claf, Inc.	Kraft Foods Global
Atlas Roofing Corporation	Land O Lakes
Bausch & Lomb	M&M Mars, Inc.
Bemis Company	Mead Westvaco
Boston Scientific	Monsanto Company
Bruno Rimini Corp.	Morris Packaging
BTD Manufacturing, Inc.	National Starch and Chemical
Canberra	Oblon-Spivak-McClelland Maier
Cardinal Medical Health Products	Outlook Group
Cargill Dow Polymers	Packaging & Technology Integrated Solutions
Clorox Company	Pakit, Inc.
Coca Cola	Perfecseal
Comet Cream Corporation	Pfizer Pharmaceuticals
ConAgra Foods	Pliant Corporation
Diageo	Prestige Brands, Inc.
Dupont de Nemours	Proflowers.com
Edwards Lifesciences	QLM Consulting
Electrolux Home Products	QVC, Inc.
Eli Lilly Corporation	Ricetec, Inc.
E-Saeng Company	SC Johnson
Federal Express	Sealed Air Corporation
Fibre Box Association	Seatac Packaging Mfg.
Filmco, Inc.	Stora Enso North America
Gateway Packaging Company	Temple-Inland, Inc.
General Mills	Trinity Packaging
Hilex Poly	Weaver Popcorn
Honeywell Specialty Films	Wrigley Company
Interchem Corporation	York Partners, LLC
International Packaging Company	Watson Foods
International Packaging Company	

#### **AGENCIES**

Chestnut Growers, Inc.	Farmers Rice Cooperative
Environmental Protection Agency	Federal Aviation Authority

GS1 Business Case  
Iowa State University  
Luna Innovations and US Navy  
Michigan Apple Research Committee  
Michigan Asparagus Board  
Michigan Corn Growers Association  
Michigan Department of Agriculture  
Michigan Soybean Promotion  
Committee  
Michigan State Horticultural Society  
Midwest Nut Producers Council

National Science Foundation  
National Watermelon Promotion Board  
National Wood Pallet Container Assoc.  
Recycled Paperboard Technology  
Assoc.  
Sterile Barrier Association  
United Network for Organ Sharing  
United Soybean Board  
University of Nebraska  
US Department of Agriculture  
US Department of the Army

The following listings illustrate the variety of research activities carried out by our faculty and graduate students, and some of the results of that research in the form of patents, presentations and publications. Please be advised that the list is not totally complete.

### **Patents and Patents Pending**

Methods of Making Nanocomposites and Compositions of Rubber Toughened Polyhydroxyalkanoates, A. K. Mohanty and Y. Parulekar US Patent No: US7,420,011 B2, Sep 2, 2008.

Biocomposites Sheet Molding and Methods of Making Those. Inventors: L.T. Drzal, G. Mehta, K. Thayer, M. Misra, A.K. Mohanty. PCT Int. Appl., 69 pp. WO 2005037516 A3, patent pending, 2005.

Biodegradable Polymeric Nanocomposite Packaging Materials and Production Methods. A. K. Mohanty, Y. Parulekar, M. Chidambarakumar, N. Kositruangchai and B. R. Harte. PCT Int. Appl., 2007/022080 A2, patent pending, 2007.

Device for Detecting Oxygen with Oxidase. A.E. Gardiol, R. Hernandez, and B.R. Harte. US5804401, Sept 8, 1998.

Method and Device for Reducing Oxygen with a Reduced Oxidase with Color Formation. US5654164, Aug 5, 1997.

Micro-encapsulation of Volatile Compounds into Beta-Cyclodextrins. E. Almenar, R. Auras, M. Rubino and B. Harte. Submitted as a provisional patent application to the US Patent and Trademark Office, 2006.

Microperforated Poly(lactic acid) Packaging Systems and the Method of Preparation Thereof. E. Almenar, R. Auras, H. Samsudin, B. Harte, M. Rubino, J. Harte. Invention disclosure number: TEC 2009-0023 XPT; U.S. Provisional patent application Serial #: 61/122,192, Dec.15, 2008.

New Alternatives to Avoid Fungal Growth in Food Systems. E. Almenar, R. Auras, B. Harte, M. Rubino. Invention Disclosure Number: 06-073; Provisional Patent Application # 60,598-013.

Novel aGreen@ Materials from Soy Meal and Natural Rubber Blends. A.K. Mohanty, Q. Wu and S. Selke. PCT Int. Appl. (2006), 72 pp. WO 2006020998 A2 20060223 (Patent Pending).

Prepreg Polyester Sheet Molding Containing Natural Fibers and Methods of Making Those. L.T. Drzal, G. Mehta, K. Thayer, M. Misra, A.K. Mohanty. PCT Int. Appl. (2005), 69 pp. WO 2005037516 A2 (Patent Pending).

$\beta$ -cyclodextrins as Nucleating Agents for Polylactide (PLA). E. Almenar, R. Auras, B. Harte, M. Rubino. U.S Patent No. 12/201,452, August 8, 2008.

### **Books, 1990-2009**

Biodegradation and Packaging. S. Selke, Pira Reviews of Packaging, Antony Rowe Ltd., Chippenham, Wiltshire, UK, 1990.

Cartons, Crates and Corrugated Board: Handbook of Paper and Wood Packaging Technology, D. Twede and S. Selke. DEStech Pub. Inc., Lancaster, PA, 2005.

Plastics Packaging: Properties, Processing, Applications, and Regulations, 2nd ed., S. Selke, J. Culter, and R. Hernandez, Hanser Pub., Munich, 2004.

WorldPak 2002, Improving the Quality of Life Through Packaging Innovation. D. Twede, B. Harte and P. Singh, CRC Press, Boca Raton, FL, 2002.

Plastics Packaging: Properties, Processing, Applications, and Regulations. R. Hernandez, S. Selke, and J. Culter. Hanser Pub., Munich, (also published as Chinese translation), 2000.

Understanding Plastics Packaging Technology. S. Selke. Hanser Pub., Munich, (also published as Chinese translation), 1997.

Packaging of Pharmaceuticals and Healthcare Products. H. Lockhart and F.A. Paine, Blackie Academic & Professional, Glasgow, 1996.

Biodegradation and Packaging, 2nd ed., S. Selke. Pira Reviews of Packaging, Antony Rowe Ltd., Chippenham, Wiltshire, UK, 1996.

Distribution Packaging Technology Handbook. S.P. Singh, Institute of Packaging Professionals, 1995.

Packaging and the Environment: Alternatives, Trends and Solutions. Rev. ed. S. Selke. Technomic Pub. Co. Inc., Lancaster, PA, 1994.

Progress in Material Handling Research. P. Singh. Material Handling Institute of America, 1993.

A Technical Framework for Life-Cycle Assessment. J. Fava, R. Denison, B. Jones, M. Curran, B. Vigon, S. Selke, J. Barnum. Society of Environmental Toxicology and Chemistry, Washington, D.C., 1991.

Packaging and the Environment: Alternatives, Trends and Solutions. S. Selke. Technomic Pub. Co., (also published as German translation), 1990.

### **Book Chapters, 1990-2009**

#### **2009**

Packaging Economics. D. Twede. Wiley Encyclopedia of Packaging Technology, 3rd edition, ed. Kit Yam, New York: Wiley, in press. 2009.

#### **2008**

Chapter 5- Biomechanical Analysis of Opening Glass Jars. J. Fair, L. Bix, and T.R. Bush. In: Designing Inclusive Futures. Editors: Langdon, P., Clarkson, J and Robinson, P. Springer- Verlag, London, UK. (DOI 10.1007/978-1-84800-211-1), 2008.

Degradation of Biodegradable Packaging Materials in Real and Simulated Conditions. T. Kijchavengkul, G. Kale, R. Auras. ACS Publication, 2008.

Bags, Bulk, Flexible Intermediate Bulk Containers. D. Twede. Wiley Encyclopedia of Packaging Technology, 3rd, ed., Kit Yam, New York: Wiley, in press 2008.

Logistical/Distribution Packaging. D. Twede. Wiley Encyclopedia of Packaging Technology, 3rd edition, ed. Kit Yam, New York: Wiley, in press, 2008.

The History of Packaging. D. Twede. Dictionary of American History Dynamic Reference, ed. Gary Cross, Robert Maddox & William Pencak. Charles Scribner's Sons/Gale, (In the Dynamic Reference, new articles and revisions of older articles are issued regularly in electronic format, to be collected later in print), in press, 2008.

#### **2007**

Food Packaging Distribution Systems, chapter of UNESCO's. D. Twede. Encyclopedia of Life Support Systems, Food Packaging Technology section, ed. Kit Yam. Food and Agricultural Sciences, Engineering and Technology Resources volume, 2007.

New Trends in Assessment of Compostability of Biodegradable Polymeric Packages. In: Leading-Edge Environmental Biodegradation Research. G. Kale, T. Kijchavengkul, and R. Auras. L.E. Pawley, Editor. Nova Science Publishers: Hauppauge, NY, 2007.

Solidification Structures and Properties of Cast Samples of Zinc B Aluminum Alloys and Composites. R. Auras and C. Schvezov. Edited by C. E. Eckert. Light Metals, 869-874, 1999. ISBN: 0-87339-425-9, 2007

Solubility of Gases and Vapors in Polylactide Polymers. Thermodynamics, Solubility and Environmental Issues. R. Auras. Ed. Trevor Letcher. Elsevier. Ch. 19. 343-368. ISBN-13:9780444527073, 2007.

#### **2006**

Advances in Packaging Technologies for Fresh Fruit and Vegetables. E. Almenar, P. Hernández-Muñoz, Lagarón, J.M., Catalá, R., Gavara. In: Advances in Postharvest Technologies of Horticultural Crops. Benkeblia Nouredine and Shiomi Norio, Eds. Editorial: Research Signpost Publisher, Kerala (India). Pp. 87-112, 2006.

Damage Reduction to Food Products During Transportation and Handling. P. Singh. In: Handbook of Food Products, 2006.

Plastics Recycling and Biodegradable Plastics. S. Selke. In: Handbook of Plastics, C. Harper, ed., McGraw-Hill, New York, 8.1-8.109, 2006.

## **2005**

Cartons, Crates and Corrugated Board: Handbook of Paper and Wood Packaging Technology. D. Twede and S.E.M. Selke. Lancaster, PA: DesTech Publications, 2005.

Food Packaging: Plastics. S. Selke. In: Handbook of Food Technology and Engineering, Vol. 3, Y. Hui, ed., CRC Taylor & Francis, Boca Raton, pp. 131.1 B 131.15, 2005.

Natural Fibers, Biopolymers, and Biocomposites: An Introduction. A.K. Mohanty, M. Misra, L.T. Drzal, S.E. Selke, B.R. Harte, and G. Hinrichsen. In: Natural Fibers, Biopolymers and Biocomposites, Editors: A.K. Mohanty, M. Misra, L.T. Drzal, eds., CRC Press, Boca Raton, FL, p. 1-36, 2005.

## **2004**

The Environmental Impacts of Detergent Packaging: the Case of Plastic Bottles. The Environmental Impacts of Detergent Packaging: the Case of Plastic Bottles. S. Selke. In: Handbook of Detergents, Part B: Environmental Impact, U. Zoller, ed., Surfactant Science Series Vol. 121, Marcel Dekker, New York, pp. 299-316, 2004.

## **2003**

Applications of Plastic Films in Packaging. S. Selke. In: Handbook of Plastic Films, E.M. Abdel-Bary, ed., Rapra Technology, Ltd., Shrewsbury, Shropshire, UK, pp. 235-262, 2003.

Logistical Packaging for Food Marketing Systems. D. Twede and B.R. Harte. In: Food Packaging Technology, R. Coles and D. McDowell, eds., Sheffield Academic Press, 2003.

Plastics in Packaging. S. Selke. In: Plastics and the Environment, A. Andrady, ed., Wiley-Interscience, New Jersey, pp. 139-183, 2003.

## **2002**

Plastics Recycling. S. Selke. In: Handbook of Plastics, Elastomers, and Composites, 4th ed., C. Harper, ed., McGraw-Hill, New York, pp. 693-757, 2002.

Improving the Quality of Life through Packaging Innovation. B. Harte, S.P. Singh and D. Twede, eds. 2002. Worldpak (proceedings), Boca Raton: CRC Press, 2002.

## **2001**

Materials Recycling. S. Selke. In: Handbook of Materials for Product Design, C. Harper, ed., McGraw-Hill, New York, pp. 14.1-14.106, 2001.

## **2000**

Plastics Recycling and Biodegradable Plastics. S. Selke. In: Modern Plastics Handbook, C. Harper, ed., McGraw-Hill, New York, pp. 12.1-12.108, 2000.

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Packaging Options. S. Selke. In Food Industry and the Environment in the European Union: Practical Issues and Cost Implications, 2nd ed., J. Dalzell, ed., Aspen Publishers, Inc., Gaithersburg, MD, pp. 253-290, 1999.

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Bags, Bulk, Flexible Intermediate Bulk Containers. D. Twede. In: Wiley Encyclopedia of Packaging Technology, A.L. Brody and K.S. Marsh, eds., Wiley, New York, pp 51-54, 1997.

Transport Packaging. S.P. Singh. In: Tool and Manufacturing Engineers Handbook, Society of Manufacturing Engineers, 1997.

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Recycling of Plastic Materials. S. Selke. In: Handbook of Plastics, Elastomers, and Composites, 3rd ed., C. Harper, ed., McGraw-Hill, New York, pp. 11.1-11.54, 1996.

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Packaging Options. S. Selke. In: Food Industry and the Environment, J. Dalzell, ed., Blackie, Glasgow, pp. 283-317, 1994.

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The Influence of Microwave Heating on the Formation of N-nitrosamines in Bacon. C.H. Chen, B.R. Harte, J.I. Gray and A. Booren. In: Food and Packaging Interactions II, ACS Symposium Series 473. Chapter 11, 1991.

## **1990**

Anhydrous Hydrogen Fluoride in Polysaccharide Solvolysis and Glycoprotein Deglycosylation. G. Rorrer, M. Hawley, S. Selke, D. Lamport and P. Dey. In: Methods in Plant Biochemistry, 1990.

Packaging of Juices Using Polymeric Barrier Containers. J. Miltz, C. Mannheim and B.R. Harte. In: Barrier Polymers and Structures. W. Koros, ed., ACS Symposium Series, 1990.

## **Refereed Journal Publications, 2000-2009**

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Almenar, E., Hernández-Muñoz, P., Gavara, R. Evolution of Selected Volatiles in Chitosan-coated Strawberries (*Fragaria H ananassa*) During Refrigerated Storage. *Journal Agricultural and Food Chemistry*, 57:974-980, 2009.

Almenar, E., Samsudin, H., Auras, R., Hate, J. Consumer Preference for an Alternative Package to the Commercial Clamshell for Fresh Blueberries. *Postharvest Biology and Technology*, submitted, 2009.

Almenar, E., Gavara, R., Hernández-Muñoz, P. Influence of Chitosan Coatings with or without Calcium on the Development of Strawberry Aroma Compounds During Postharvest Life. *Journal Agricultural and Food Chemistry*, submitted, 2009.

Almenar, E., Hernández-Muñoz, P., Catalá, R., Gavara, R. Optimization of an Active Package for Wild Strawberries Based on the Release of 2-nonanone. *LWT-Food Science and Technology*, 42:587-593, 2009.

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Almenar, E., Samsudin, H., Auras, R., Rubino, M., Harte, B. Postharvest Shelf Life Extension of Small Berries Using a Biodegradable Package. *Food Chemistry*, 110, 1:120-127, doi:10.1016/j.foodchem.2008.01.066, 2008.

Almenar, E., Samsudin, H., Auras, R., Harte, B., Rubino, M. Postharvest Shelf Life Extension of Blueberries Using a Biodegradable Package. *Food Chemistry*, 100, 1:120-127, 2008.

Chonhenchob, V., Kamhangwong, D., Singh, S.P. Comparison of Reusable and Single-use Plastic and Paper Shipping Containers for Distribution of Fresh Pineapples. *Packaging Technology and Science*, 21, 2:73-83, 2008.

Garcia-Romeu-Martinez, M. A., Singh, S.P., Cloquell-Ballester, V.A. Measurement and Analysis of Vibration Levels for Truck Transport in Spain as a Function of Payload, Suspension and Speed. *Packaging Technology and Science*, 21, 8:439-451, 2008.

Hernández-Muñoz, P., Almenar, E., Del Valle, V., Velez, D., Gavara, R. Effect of Chitosan Coating Combined with Postharvest Calcium Treatment on Strawberry (*Fragaria x ananassa*) Quality During Refrigerated Storage Postharvest Shelf Life Extension of Strawberries Using a Biodegradable Package. *Food Chemistry*, 110, 2:428-435, 2008.

Huda, M. S., Drzal, L.T., Mohanty, A.K., Misra, M. Effect of Chemical Modifications of the Pineapple Leaf Fiber Surfaces on the Interfacial and Mechanical Properties of Laminated Biocomposites. *Composite Interfaces*, 15, 2-3:169-191, 2008.

Huda, M. S., Drzal, L.T., Mohanty, A.K., Misra, M. Effect of Fiber Surface-treatments on the Properties of Laminated Biocomposites from Poly(lactic acid) (PLA) and Kenaf Fibers. *Composites Science and Technology*, 68, 2:424-432, 2008.

Jarimopas, B., Pushpariksha, P., Singh, S.P., Sothornvit, R. Mechanical and Light Properties of Mangosteen Fruit as Related to Postharvest Quality. *Journal of Testing and Evaluation*, 36, 2: 191-197, 2008.

Jarimopas, B., Rachanukroa, D., Singh, S.P., Singh, J. Post-harvest Damage and Performance Comparison of Sweet Tamarind Packaging. *Journal of Food Engineering*, 88, 2:193-201, 2008.

Kijchavengkul, T., Auras, R. A Perspective of Compostability of Biodegradable Polymers under Real and Simulated Conditions. *Polymer International*, 57, 6:793-804, DOI: 10.1002/pi.2420, 2008.

Kijchavengkul, T., Auras, R., Rubino, M., Ngoujio, M., Fernandez, R.T. Assessment of Biodegradable Mulch Films. Part II: Laboratory Simulated Conditions. *Chemosphere*, 71, 9:1607-1616, doi:10.1016/j.chemosphere.2008.01.037, 2008.

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- Qin, Y., Rubino, M., Auras, R., Lim, L.T. Impact of Polymer Processing on Sorption of Benzaldehyde Vapor in Amorphous and Semicrystalline Polypropylene. *Journal of Applied Polymer Science*, 110, 3:1509-1514. DOI: 10.1002/app.28314, 2008.
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- Drown, E.K., Mohanty, A.K., Parulekar, Y., Hasija, D., Harte, B.R. and Misra, M. The Surface Characteristics of Organo Clays and Their Effect on the Properties of Poly (Trimethylene terephthalate) Nanocomposites. *Composites Science and Technology*. 67:3168, 2007.
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## **2007**

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Auras, R. The Marriage of Packaging and Biomaterials: Present and Future. Society of Plastics Engineers 2007 Annual Technical Meeting, ANTEC-07, Cincinnati, Ohio, May 6 - 10, 2007.

Bix, L. and Lockhart, H. (July 9, 2007). Added Product Complexities Demand Thoughtful Packaging: An Examination of What Packaging can and must do for Medical Products. @ 34th Annual Meeting and Exposition of the Controlled Release Society, Long Beach, CA. July 6 - 11, 2007.

Bix, L., Cardoso, F., de la Fuente, J., Steckler, C. and Luebke, L. (September 4, 2007). Comparative Study of Two Methods to Quantify the Surface Area of Touch Between Consumers and Packaging. The 23rd Symposium of the International Association of Packaging Research Institutes (IAPRI). Windsor, UK, September 3 - 5, 2007.

Burgess, G. and Mahajerin, E. Computer Modeling of Vibration During Truck Transportation. Proceedings of the Canadian Conference on Applied Mechanics, Toronto, Canada, June 3 - 7, 2007.

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Kumar, P., Auras, R., Rubino, M., Almenar, E., Harte, J. Effect of Container Shape on Barrier Properties. 23rd IAPRI Symposium on Packaging (IAPRI), Windsor, England, oral, 2007.

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Twede, D. The History of Corrugated Fiberboard Shipping Containers, Marketing at the Center: Proceedings of the 13th Biennial Conference on Historical Analysis and Research in Marketing. Edited by Blaine J. Branchik, Durham, North Carolina: CHARM Association, pp. 243-246. Presented at Duke University, May, 2007.

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Auras, R. and Bix, L. Broader Implications of Using New Technologies in Packaging Classes: How Inclusive is Your Classroom? The 15th World Conference on Packaging of the International Association of Packaging Research Institutes (IAPRI), Tokyo, Japan, October 2 - 5, 2006.

Bix, L. and de la Fuente, J. User-centered Design: Wave of the Future. PLACE 2006 Conference of the Technical Association for the Worldwide Paper Pulp and Converting Industry (TAPPI). September 17 - 21, 2006.

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Burgess, G. and Mahajerin, E. Failure of a Ground-Supported Horizontal Tank Containing Liquid Fertilizer. Submitted to Annual ASME Conference, January, 2006.

Clarke, R.H. Packaging: How it Impacts RFID Integration. RFID Academic Convocation, Massachusetts Institute of Technology, Cambridge MA, January, 2006.

Clarke, R.H. Radio Frequency Identification and Food Marketing. Featured Speaker, RFID: Lessons from the Real World, Food Marketing Institute Marketechncs, San Diego, CA, January, 2006.

Clarke, R.H. RFID Smart Label Performance Variables. Featured Speaker, RFID World, Interactive Label Summit, Dallas TX, February, 2006.

de la Fuente, J. and Bix, L. A Universal Design Process for Developing Child Resistant Packaging. The 15th World Conference on Packaging of the International Association of Packaging Research Institutes (IAPRI), Tokyo, Japan. October 2 - 5, 2006.

Drown, E.K., Mohanty, A.K., Hasija, D., Harte, B., Misra, M. and Kurian, J. Biobased Nanocomposites from Poly(trimethylene terephthlate) and Organoclays. 21st Annual Technical Conference of the American Society for Composites (ASC), Dearborn, MI, September 18 - 20, 2006.

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Gulati, N., Auras, R., Rubino, M. Analysis of Water Vapor Sorption on Poly(lactide) Using a Quartz Crystal Microbalance. IAPRI 2006, Tokyo, Japan, October 5 - 8, 2006 / Western Michigan University, Barrier Coating Symposium, Kalamazoo, MI, October 11 - 12, 2006.

Gulati, N., Auras, R., Rubino, M. Assessment of Moisture Barrier of Poly(Lactide) Polymers Using a Quartz Crystal Microbalance, IFT 2006, Orlando, FL, June 26 - 29, 2006.

Joneson, E. and Singh, S.P. Developing Safe Loading and Damage Reduction Methods for Less than Truck Load Shipments. 15th International IAPRI World Conference on Packaging, International Association of Packaging Research Institutes, Tokyo, Japan, 2006.

Kale, G., Auras, R., Singh, P. Comparing the Degradability of Commercially Available Biodegradable Packages in Composting and Ambient Exposure Conditions. GPEC, Atlanta, GA, February 26 - 28, 2006.

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Kijchavengkul, T., Auras, R., Rubino, M., Ngouajio, M., Fernandez, T. Development of a Respirometric System to Test Biopolymer Degradation. GPEC, Atlanta, GA, February 26-28, 2006.

Kijchvengkul, T., Auras, R., Rubino, M., Ngouajio, M., Fernandez, R. Measurement of Polylactide Bottles Compostability Using a Computerized Respirometric System. IAPRI 2006, Tokyo, Japan, October 5 - 8, 2006.

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Kou, E. and Bix, L. Can People with Arthritis Access Their Medications? The 15th World Conference on Packaging of the International Association of Packaging Research Institutes (IAPRI), Tokyo, Japan, October 2-5, 2006.

Kumar, P., Qin, Y., Auras, R., Rubino, M., Risch, S., Harte, J. Relationship Between Flavor Perception and Package Configuration. 231th American Chemical Society National Meeting, Atlanta, GA, March 26 - 30, 2006.

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Qin, Y., Rubino, M., Auras, R. Two-Stage Sorption of Benzaldehyde by Rubbery Polypropylene. 231st American Chemical Society National Meeting, Atlanta, GA, March 26 - 30, 2006.

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Rubino, M., Qin Y., Auras, R., Lockhart, H. Relationship between Mass Transfer of Permeants and Polymer Processing. TAPPI 2006 PLACE Conference, Cincinnati, OH, September 17 - 21, 2006.

Selke, S. Bix, L., Bhutani, S. Comparison of Life Cycle Impacts of JAWS Glass Cleaner and Conventional Glass Cleaner Packaging Systems. JAWS International, Toledo, OH, <[http://www.jawsinternational.com/pdfs/Environmental\\_Impact\\_Study.pdf](http://www.jawsinternational.com/pdfs/Environmental_Impact_Study.pdf)>, 2006.

Shin, S., Ryser, E., Selke, S. and Harte, B. Evaluation of the Microbial Inhibition Performance of Gas Type Antimicrobials (chlorine dioxide and allyl-isothiocyanate) with Modified Atmosphere Packaging (MAP), and the Effect of Chlorine Dioxide Exposure on the Physical Properties of Plastic Films. Proceedings, 15th IAPRI World Conference on Packaging, 2006.

Singh, J. and Singh, S. P. Performance Comparison of Thermal Insulated Packaging Systems for Single Parcel Shipments. 15th International IAPRI World Conference on Packaging, International Association of Packaging Research Institutes, Tokyo, Japan, 2006.

Singh, J. and Singh, S.P. Measurement and Analysis of the Truck and Rail Shipping Environment in India. Dimensions 06, International Safe Transit Association, 2006.

Singh, J., Singh, S.P. and Gaur, P. Measurement, Analysis and Comparison of Express and Priority Parcel Shipping Environment of United States Postal Service with Commercial Carriers. 15th International IAPRI World Conference on Packaging, International Association of Packaging Research Institutes, Tokyo, Japan, 2006.

Singh, J., Vorst, K., Singh, S.P. and Lao, M. The Relevance of Drop Tester Accuracy. 15th International IAPRI World Conference on Packaging, International Association of Packaging Research Institutes, Tokyo, Japan, 2006.

Singh, S.P. An Update on Packaging and Distribution for the Global Supply Chain. Presented as one-day seminar in Bangkok, Thailand, 2006.

Singh, S.P. Distribution Packaging Trends for Global Supply Chain. Packaging Design and Brand Slam Summit, West Palm Beach, FL, 2006.

Singh, S.P. Update on Packaging and E-Commerce Trends in the United States. National Conference on Order Fulfillment, Orlando, FL, 2006.

Singh, S.P. and Joneson, E. Dynamics of Less than Truck Load Shipments. Annual NIPHLE Conference, Baltimore, MD, 2006.

Singh, S.P. and Joneson, E. Video and Measurement of Dynamics of a Less than Truck Load Shipment. Dimensions 06, International Safe Transit Association, 2006.

Singh, S.P. and Paek, Y. New Pressure Sensitive Device to Measure and Predict Drops. 15th International IAPRI World Conference on Packaging, International Association of Packaging Research Institutes, Tokyo, Japan, 2006.

Singh, S.P., Singh, J. and Joneson, E. Measurement and Analysis of Global Truck, Rail and Parcel Shipments. 15th International IAPRI World Conference on Packaging, International Association of Packaging Research Institutes, Tokyo, Japan, 2006.

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Aithani, D., Lockhart, H., Auras, R., Tanprasert, K. A New Technique for Heat Sealing Measurement. IAPRI 2005, Campinas, Brazil, May 22 - 25, 2005.

Arif, S., Burgess, G., Narayan, R. and Harte, B. Evaluation of Biodegradable Foam for Packaging Applications. IFT Annual Meeting, Contributor, July 15 - 20, 2005.

Auras, R. Sorption of Ethyl Acetate in Poly(lactide) Polymers. IDS-Packaging 2005, Online Conference, January 17 B February 4, 2005.

Auras, R. and Rubino, M. A New System and Technique to Determinate Sorption and Permeation of Moisture and Organic Compounds for Container Closure Systems. IAPRI 2005, Campinas, Brazil, May 22 - 25, 2005.

Auras, R., Harte, B. and Selke, S. A New Era of Biodegradable Polymers for Packaging Application. Antec, 2005.

Auras, R., Harte, B., Selke, S. Polylactides, a New Era of Biodegradable Polymers for Packaging Application. ANTEC=05, Boston, MA, May 1 - 5, 2005.

Auras, R., Singh, P., Singh, J. Evaluation of OPLA Polymers with Existing PET and OPS for Fresh Food Service Containers. GPEC 2005, Atlanta, GA, February 24 - 25, 2005.

Clarke, R.H. Focus on the Future: An RFID Roadmap. RFID Executive Roundtable, Chicago IL, December, 2005.

Clarke, R.H. Challenges of Active and Passive RFID Infrastructure. The Active RFID Summit, IDTechEx, San Antonio, TX, November, 2005.



Clarke, R.H. MSU RFID Experimentation. Institute of Packaging Professionals Joint Chapter Meeting, East Lansing, MI, April, 2005.

Clarke, R.H. Overcoming The Challenges of Transforming RF Technology into a Practical Packaging Technology. PharmaIQ Workshop, King of Prussia, PA, April, 2005.

Clarke, R.H. RFID and Contract Packaging. Contract Packaging Association National Meeting, Phoenix, AZ, March, 2005.

Clarke, R.H. RFID and Packaging Ideas. Institute of Packaging Professionals, Michigan Chapter Meeting, Novi, MI, March, 2005.

Clarke, R.H. RFID Testing Demonstrates Problem Areas. Invited presentation, International Packaging Symposium, Tokyo, Japan, July, 2005.

Clarke, R.H. RFID: General Technology. Invited presentation, 2005 Michigan Technology Conference, Dearborn, MI, September, 2005.

Clarke, R.H. RFID: What=s New, What=s Next. The PMA Fresh Summit 2005, Produce Marketing Association, Atlanta GA, November, 2005.

Clarke, R.H. The Challenges of Transforming RFID Technology into a Practical Packaging Technology. Forum for Innovation, Cap Tech/Induniv, San Juan, PR, April, 2005.

de la Fuente, J. and Bix, L. Applying Universal Design to Child Resistant Packaging. Include 2005: International Conference on Inclusive Design, Royal College of Art, London, UK, April 5 - 8, 2005.

de la Fuente, J. and Bix, L. Universal Design Methodology for the Development of Child Resistant Drug Packages. International Association of Packaging Research Institutes (IAPRI) Annual Conference, Cetea, Brazil, May 22 - 25, 2005.

Kale, G., Singh, P., Auras, R. Evaluation of Compostability of Commercially Available Biodegradable Packages in Real Composting Conditions. AIChE, Cincinnati, OH, November, 2005.

Liu, W., Thayer, K., Misra, M., Drzal, L.T. and Mohanty, A.K. Processing Methods and Physical Properties of Native Grass Reinforced Biocomposites. Proceedings, 5th Annual SPE Automotive Composite Conference (ACCE), Troy, Michigan, September 12 - 14, 2005.

Mahajerin, E. and Burgess, G. Case Study of Buckling Failure of a Large Liquid Storage Tank. ASME Pressure Vessels and Piping Division Conference. Denver, Colorado. Contributor, July 17 - 21, 2005.

Qin, Y., Rubino, M., Auras, R. Effect of Container Shape on Flavor Scalping in Polymeric Food Containers. 230th American Chemical Society National Meeting, Washington, DC, August 28 - September 1, 2005.

Qin, Y., Rubino, M., Auras, R. and Lockhart, H. Effect of Container Processing and Container Shape on Sorption in Polypropylene Containers. 2nd Annual Meeting of the Center for the National Science Foundation Industry/University Cooperative Research Center for Multiphase Transport Phenomena, East Lansing, MI, September 13, 2005.

Singh S.P. and Risch, S.J. Update on RFID Technology and Global Distribution Measurement for Packages. International Packaging Conference, CETEA, Sao Paulo, Brazil, 2005.

Singh, S. P., Singh, J. and Joneson, E. Global Distribution Environment Measurement Project. IAPRI Conference, Sao Paulo, Brazil, 2005.

Singh, S.P. and Auras, R. Developing Package Compostability Test Methods for Bio-based Materials. Annual NIPHLE Conference, Stockton, CA, 2005.

Singh, S.P. and Singh, J. Pictorial Markings for Packaging to Prevent Damage and Liability. IAPRI Conference, Sao Paulo, Brazil, 2005.

Singh, S.P., McCartney, M. and Singh, J. Developing RFID Technology for Perishables Supply Chain. IAPRI Conference, Sao Paulo, Brazil, 2005.

Vorst, K., Burgess, G., Todd, E. and Ryser, E. Transfer Coefficients and Predictive Models for Listeria Monocytogenes Transfer During Slicing of Deli Meats. International Association for Food Protection, Annual Meeting, Calgary. Contributor, August, 2005.

## 2004

Almenar, E., Hernández-Muñoz, P., Gavara, R., Lagarón, J.M., Catalá, R. Active Packaging for Wild Strawberry Fruit (*Fragaria vesca* L.). Proceedings of the 3th Spanish Congress on Food Engineering (CESIA 2004) [CD Rom]. Pamplona (Spain). ISBN: 84-688-7989-4. Pp. 1077-1086, poster, 2004.

Auras, R., Harte, B., and Selke, S. Prediction of Affinity Between Chemical Compounds in Food and Packaging Polymers Using Solubility Parameters. IFT 2004. Las Vegas, NV, July 14 - 17, 2004.

Bix, L., Clarke, R., Sansgiry, S. and Cardoso, F. Do Tagging Practices of OTC Drugs Present a Liability? TRAX Pharmaceutical Supply Chain Summit, Washington, DC, July 20 - 22, 2004.

Bix, L., Rifon, N., Lockhart, H. and de la Fuente, J. The Packaging Matrix: Linking Package Design Criteria to the Marketing Mix. Industry IDS, Inc. Packaging 2004 Conference, January 19 - February 5, 2004.

Chonhenchob, V. and Singh, S.P. Packaging Performance Comparison for Distribution and Export of Papaya Fruit. 14th IAPRI World Conference on Packaging, Stockholm, Sweden, 2004.

Clarke, R.H. Advancements in RFID Technology. Invited presentation, National Institute of Packaging, Handling and Logistics Engineers Conference, Williamsburg, VA, October, 2004.

Clarke, R.H. An Introduction to Radio Frequency Identification from MSU. Invited presentation, Western Michigan RFID Users Group, Kalamazoo, MI, August, 2004.

Clarke, R.H. General Packaging Session. American Forestry and Paper Association Paper Week Conference, New York, NY, invited presentation, March, 2004.

Clarke, R.H. Lab Readings Warn of In-plant RFID Limitations. Invited presentation, Pack Expo, Chicago, IL, November, 2004.

Clarke, R.H. Mapping the Reach of Your Global RFID System. Invited presentation, Smart Labels USA Conference, Boston, MA, March, 2004.

Clarke, R.H. MSU Answers Some RFID Packaging Questions, Raises Others. Invited presentation, The Packaging Machinery Manufacturers Institute Coding Conference, San Mateo, CA, January, 2004.

Clarke, R.H. Radio Frequency Identification Research at MSU. Temple Inland Corporate Tour, Chicago IL, Denver, CO, Los Angeles, CA, Dallas, TX, Atlanta, GA, July, 2004.

Clarke, R.H. Radio Frequency Identification. Colgate-Palmolive Corporate Packaging Group, New York, NY, May, 2004.

Clarke, R.H. Research Update on MSU Auto Identification Laboratory Projects. Invited presentation, RFID Fresh Conference, Monterey, CA, September, 2004.

Clarke, R.H. RFID for Consumer Packaging. Kraft Foods Corporate Packaging Group, Northfield, IL, July, 2004.

Clarke, R.H. RFID Implementation Issues or, Will Distribution Kill Your Tags? Temple Inland Client Conference, New York, NY, March, 2004.

Clarke, R.H. RFID Laboratory Projects: From There To Here. American Society of Testing and Materials D-10 Committee Meeting, Washington, DC, October, 2004.

Clarke, R.H. RFID Testing at the MSU School of Packaging. IoPP International Student Conference, Rochester Institute of Technology, Rochester, NY, April, 2004.

Clarke, R.H. Temple Inland RFID Update. Inland RFID Corporate Strategy Meeting, Austin, TX, April, 2004.

Clarke, R.H. Testing RFID for Real World Adoption & Dynamic Durability Testing for Tagged Cases. Invited presentation, Smart Labels USA Conference, Boston, MA, March, 2004.

Clarke, R.H. Testing Tagged Cases for Real World Adoption. General Mills Corporate Packaging meeting, Minneapolis, MN, April, 2004.

Clarke, R.H. The Effects of Tag Orientation and Package Content on the Readability of Radio Frequency Identification Transponders. Anheuser-Busch Corporate Offices, St. Louis, MO, April, 2004.

Clarke, R.H. The Relevance of Radio Frequency in Food Packaging and Quality Assurance. Invited presentation, Midwest Food Processors Association 100th Anniversary Conference, La Crosse, WI, December, 2004.

Goodwin, D., and Singh, S.P. The Need to Define Pre-Set Instrumentation Requirements for the Measurement of Various Parameters of the Distribution Environment. 14th IAPRI World Conference on Packaging, Stockholm, Sweden, 2004.

Hughes, H.A. Simulation of Packaging Lines. NIPHLE, Harrisburg, PA, 2004.

Mahajerin, E. & Burgess, G. Determination of the Three-Parameter Weibull Distribution and Confidence Bands from Experimental Fatigue Data. 2004 ASME Pressure Vessels and Piping Conference, San Diego, CA, July 25 - 29, 2004.

Mehta, G., Mohanty, A.K., Thayer, K., Drzal, L.T. and Misra, M. Low Cost Bio-composite Sheet Molding Compound Panel: Processing and Property Evaluation. 10th Annual Global Plastics Environmental Conference (GPEC 2004), Detroit, MI, February 18 - 19, 2004.

Rifon, N., Bix, L., Mastin, T., Choi, S.M. and Van Hurley, V. Cigarette Warnings and Phantom Smokers: Does Belief in Warning Relate to Smoking Status? Enhancing Knowledge Development in Marketing: 2004 American Marketing Association Summer Educators Conference, Boston, MA, August 6 - 9, 2004.

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