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## 1. RESEARCH INTERESTS

- Sustainable packaging systems. Packaging sustainability. Life Cycle Assessment. Carbon-neutral packaging materials. Packaging waste scenarios. Biodegradation and Compostability.
- Biodegradable and compostable polymers. Polylactide and starch polymers. Green composites & bio-composites. Properties and applications of materials in packaging.
- Food Packaging. Food product/package compatibility and interaction. Gas, vapor, and organic barrier properties. High barrier packaging. Mass transfer in polymers. Permeability, diffusion, and solubility. Specific and total migration.

## 2. ACADEMIC POSITIONS

- October 2004 – Present, Assistant Professor, School of Packaging, Michigan State University, East Lansing, MI.

## 3. EDUCATION

- *Ph.D., Packaging*. (Fall 2000 – Spring 2004), School of Packaging, Michigan State University, East Lansing, MI.
- *M.S., Material Science and Technology* (1997-1999) Institute of Technology Prof. “Jorge E. Sabato”. National Committee of Atomic Energy. University of General San Martín. Buenos Aires, Argentina.
- *B.S., Chemical Engineering* (1990 – 1996) (Six-year program) National University of Misiones. Posadas, Misiones, Argentina.

## 4. PROFESSIONAL SERVICE

Consulting for the US and International food, beverage and pharmaceutical industries regarding packaging systems.

**BPI**, Biodegradable Product Institute, Review coordinator for ASTM D6400 and D6868 composting certification. **SPC**, Sustainable Packaging Coalition, Executive Committee member October 2007 - September 2009. **IFT**, Institute of Food Technology, Member at large September 2005- September 2007. Secretary 2008-2009. **NAFSS**, National Alliance for Food Safety and Security, Member. **SPE**, Society of Plastics Engineering, Member. **ACS**, American Chemical Society, Member

## 5. PROFESSIONAL EXPERIENCE

### RESEARCH (Short Summary)

- Assistant Professor (2004-present) School of Packaging, Michigan State University, E.L., MI.
- *Post Doc.* (June – October 2004) School of Packaging, Michigan State University, E.L., MI.
- Graduate Research Assistant. 2001-2004. School of Packaging, MSU. E.L., MI.
- Graduate Research Assistant. 1996 - 1999. FCEQyN - UNaM. Misiones, Argentina.
- Undergraduate Research Assistant. 1992 - 1996. FCEQyN - UNaM. Misiones, Argentina.

### TEACHING (Short Summary)

#### Graduate classes

- Packaging Plastics Processing, PKG 828, Spring 11, online teaching, School of Packaging, MSU, East Lansing, MI.

- Packaging Materials, PKG 801, Fall 10, online teaching, School of Packaging, MSU, East Lansing, MI.
- Polymeric Packaging Materials, PKG 827. Fall 10, 09 and 08, online teaching, School of Packaging, MSU, East Lansing, MI.

#### *Undergraduate classes*

- Packaging and the Environment, PKG370. Spring 09 and 08, School of Packaging, MSU, East Lansing, MI.
- Packaging with Paper & Paperboard, PKG322. Spring 2007. School of Packaging, MSU, East Lansing, MI.
- Glass & Metal Packaging, PKG221. Fall 06, Spring 05, Fall 05. School of Packaging, MSU, East Lansing, MI.

#### *Continuing learning in Teaching*

- Lilly Fellow, Michigan State University, East Lansing, MI. Scholarship of teaching and learning.
- Certification in Teaching College Science and Mathematics (May, 2004.) <http://www.ns.msu.edu/TAcertificate/Default.htm>

## **6. PATENTS**

- Auras, Rafael; Susan Selke; Dhayalan Elangovan; Isinay Yuzay. "*Polymer Based Multi-Functional Membranes*," US Non-Provisional Patent Application # 61/246,871.
- Susan Selke; Auras, Rafael; Isinay Yuzay "*Poly(lactic acid) and zeolite composites and method of manufacturing the same*." US Non-Provisional Patent Application # 61/161,566.
- Almenar, Eva. M.; Auras, Rafael; Samsudin, Hayati; Harte, Bruce; Rubino, Maria. "*Microperforated poly(lactic acid) packaging systems and the method of Preparation Thereof*", US Non-Provisional Patent Application US # 61/122,192.
- Almenar, Eva M.; Auras, Rafael; Harte, Bruce; Rubino, Maria; "*Micro-Encapsulation of Volatile Compounds into Beta-Cyclodextrins*," PCT/US2007/005628.
- Almenar, Eva M.; Auras, Rafael; Harte, Bruce; Rubino, Maria; "*B-cyclodextrins as nucleating agents for polylactide (PLA)*," PCT/US2008/010255.
- Rubino, Maria; Siddiq, Muhammad; Auras, Rafael; Annous, Bassam; Netramai, Sิริyupa. "Package System with Distribution Gas Insert." PCT/US2008/009552

## **7. BOOK**

Auras, Rafael, Lim, Loong T., Selke, Susan, Tsuji, Hideto (Eds.) 2010. [\*Poly\(lactic acid\): Structures, Production, Synthesis, and Applications\*](#). New York, NY: John Wiley & Sons. ISBN: 978-0-470-29366-9

## **8. BOOK CHAPTERS**

- Almenar, Eva, Auras, Rafael, 2010. *Poly(lactic acid) Permeation, Sorption, and Diffusion in Poly(lactic acid)*, in *Poly(lactic acid): Structures, Production, Synthesis, and Applications*. Auras, Rafael, Lim, Loong T., Selke, Susan, Tsuji, Hideto (Eds.) New York, NY: John Wiley & Sons.
- Dethyotin, S., Kathuria, A.; Waree, J.; Selke, S.; Auras, Rafael, (Eds.) 2010. *Poly(lactic acid) Blends*, in *Poly(lactic acid): Structures, Production, Synthesis, and Applications*. Auras, Rafael, Lim, Loong T., Selke, Susan, Tsuji, Hideto (Eds.) New York, NY: John Wiley & Sons.
- Auras, Rafael. 2009. *Poly(lactic acid)*. In *Encyclopedia of Packaging Technology* NJ: John Wiley & Sons. In Press.
- Kijchavengkul, Thitisilp; Kale, Gaurav; Auras, Rafael. 2009. Degradation of Biodegradable Packaging Materials in Real and Simulated Conditions. In *Polymer Degradation and Performance*, eds. Matthew C. Celina, Jeffrey S. Wiggins, & Norman C. Billingham, ACS Publication.

- Kale, Gaurav; Kijchavengkul, Thitisilp; Auras, Rafael. 2007. New Trends in Assessment of Compostability of Biodegradable Polymeric Packages. In *Leading-Edge Environmental Biodegradation Research*, ed. L E. Pawley, Hauppauge, NY: Nova Science Publishers.
- Auras, Rafael. 2007. Solubility of Gases and Vapors in Polylactide Polymers. In *Thermodynamics, Solubility and Environmental Issues*, ed. T Letcher, Ch. 19. 343-368. ISBN-13:9780444527073. John Wiley & Sons, NJ.
- Auras, Rafael; Schvezov, Carlos. 1999. Solidification Structures and Properties of Cast Samples of Zinc-Aluminum Alloys and Composites. In *Light Metals*, ed. C E. Eckert, 869-874, 1999. ISBN:0-87339-425-9

## 9. PAPERS IN REFEREED JOURNALS

- Heberto Vazques, Joong Min Shin, Herlinda Soto-Valdez, Rafael Auras, 2011, "Release of Butylated Hydroxytoluene (BHT) from Poly(lactic acid) films," *Polymer Testing*, (2011), DOI: 10.1016/j.polymertesting.2011.03.006.
- Francisca Manzanares-Lopez, Herlinda Soto-Valdez, Rafael Auras, Elizabeth Peralta, 2011, "Release of alpha-tocopherol from poly(lactic acid) films, and its effect on the oxidative stability of soybean oil, " *Journal of Food Engineering*, Vol. 104 pp. 508–517 DOI: 10.1016/j.jfoodeng.2010.12.029.
- Minjung Joo, Nathan Lewandowski, Rafael Auras, Janice Harte, Siddiq Muhammad, Eva Almenar, 2010 "Comparative shelf life study of blackberry fruit in bio-based and petroleum-based containers under retail storage conditions" *Food Chemistry*, 2010. DOI: 10.1016/j.foodchem.2010.12.071
- Herlinda Soto-Valdez, Rafael Auras, Elizabeth Peralata, 2010, "Fabrication of Poly(lactic acid) Films with Resveratrol and the Diffusion of Resveratrol into Ethanol, " *Journal of Applied Polymer Science*, DOI 10.1002/app.33687.
- DongHo Kang, Rafael Auras, Jay Singh, Keith Vorst, 2010 "An exploratory model for predicting post-consumer recycled PET content in PET sheets," *Polymer Testing*, Vol. 30 (1) pp. 60-68 DOI: 10.1016/j.polymertesting.2010.10.010
- Jasim Ahmed, Rafael Auras, 2010. " Effect of acid hydrolysis on rheological and thermal characteristics of lentil starch slurry," *LWT Food Science and Technology*, DOI:10.1016/j.lwt.2010.08.007 0.
- Jasim Ahmed, Sunyl Varshney, Rafael Auras, Sung W. Hwang.. 2010. "Thermal and Rheological Properties of L-Polylactide/Polyethylene Glycol/Silicate Nanocomposites Films," *Journal of Food Science*. Vol. 75, Nr. 8, pp. N97-N108, DOI: 10.1111/j.1750-3841.2010.01809.x.
- Thitisilp Kijchavengkul, Rafael Auras, Maria Rubino, Susan E. M. Selke, Mathieu Ngouajio, Rodney T. Fernandez. 2010. "Biodegradation and hydrolysis rate of aliphatic aromatic polyester," *Polymer Degradation and Stability*. Vol. 95. pp. 1769-1777, DOI: 10.1016/j.polymdegradstab.2010.07.018.
- Isinay Yuzay, Rafael Auras, Herlinda Soto-Valdez, Susan E. M. Selke. 2010. "Effects of Synthetic and Natural Zeolites on Morphology and Thermal Degradation of Poly(lactic acid) Composites," *Polymer Degradation & Stability*. Vol. 95 (9) pp. 1769-1777, DOI: 10.1016/j.polymdegradstab.2010.05.01
- Casey Danyluk, Ryan Erickson, Sam Burrows, Rafael Auras. 2010. "Industrial Composting of PLA bottles," *Journal of Testing and Evaluation*, Vol. 38, No. 6, 1-7. DOI: 10.1520/JTE102685
- Rafael Auras, Valentina Bali, Laura Bix. 2010. "Students Opinions of a Student Response System for Introductory Packaging Classes," *North American Colleges and Teachers of Agriculture (NACTA)*, Forthcoming September 2010
- C. Chaiwong, P. Rachtanapun, P. Wongchaiya, R. Auras, D. Boonyawan, 2010. "Effect of Plasma Treatment on Hydrophobicity and Barrier Property of Poly(lactic acid)," *Journal of Surface and Coating*, Vol. 204, (18-19), 2933-2939. DOI: 10.1016/j.surfcoat.2010.02.048

- Eva Almenar, Hayati Samsudin, Rafael Auras, Janice Harte. 2010. Consumer acceptance of fresh blueberries in bio-based packages, *Journal of the Science of Food and Agriculture*. Vols. 90 (7) pp. 121-1128. DOI: 10.1002/jsfa.3922
- C. Q. Fang, Rafael Auras, Susan E. M. Selke. 2010. Bioadhesive from Distiller's Dried Grains with Solubles. *Advanced Materials Research* Vols. 87-88 pp. 358-362. DOI: 10.4028/www.scientific.net/AMR.87-88.358
- Thitisilp Kijchavengkul, Rafael Auras, Maria Rubino, Edgard Alvarado, Jose Camacho Montero, J. M. Rosales. 2009. Atmospheric and Soil Degradation of Aliphatic-Aromatic Polyester Films. *Polymer Degradation and Stability*. Vols. 95 (2) pp. 99-107. DOI:10.1016/j.polymdegradstab.2009.11.048.
- Jasim Ahmed, Sunyl Varshney, Rafael Auras. 2009. Rheological and Thermal Properties of Polylactide/Silicate Nanocomposites Films. *Journal of Food Science*. Vols. 75, (2) pp. N17-N24. DOI: 10.1111/j.1750-3841.2009.01496.x
- Sung W. Hwang, J. K. Shim, S. B. Lee, Rafael Auras. 2009. Design and Performance Evaluation of Multilayer Packaging Films for Blister Packaging Applications. *Journal of Applied Polymer Science*. Vol. 116, 2846–2856. DOI: 10.1002/app.31773
- Isinay Yuzay, Rafael Auras, Susan E. M. Selke. 2009. Poly(lactic acid)/Aluminum Oxide Composites Fabricated by Sol-gel and Melt Compounding Processes. *Macromolecular Physics and Engineering*. Vol. 295, 283–292 DOI: 10.1002/mame.200900223
- Isinay Yuzay, Rafael Auras, Susan E. M. Selke. 2009. Poly(lactic acid) and Zeolite Composites Prepared by Melt Processing: Morphological and Physico-Mechanical Properties. *Journal of Applied Polymer Science*. Vol. 115, 2262–2270. DOI 10.1002/app.31322.
- Mahesh Khurana, Maria Rubino, Rafael Auras, Laurent M. Matuana. 2009. Mass Transfer of Moisture in Sheets and Resins of Two Partially Renewable Polyesters. *Journal of Biobased Materials and Bioenergy*. 3 (4) 1-8. DOI:10.1166/jbmb.2009.1051.
- Rodriguez-Perez, Luis C.; Harte, Bruce; Auras, Rafael; Burgess, Gary; Beaudry, Randolph. M. 2009. "Measurement and Prediction of the Concentration of 1-Methylcyclopropene in Treatment Chambers Containing Different Packaging Materials," *Journal of Food Science and Agriculture*. Vol. 89 (15) pp. 2581-2587, DOI 10.1002/jsfa.3758.
- Sangsuwan, Jurmkawm, Rattanpanone, N., Auras, Rafael, Harte, Bruce, Rachtanapun, P. 2009. Antimicrobial effect and migration of vanillin in Chitosan-Methyl Cellulose films. *Journal of Food Science*. 74 (7): C549-C555. DOI: 10.1111/j.1750-3841.2009.01266.x.
- Netramai, Siriyupa, Rubino, Maria, Auras, Rafael, Annous, Bassam. 2009. Effect of Chlorine Dioxide Gas on Physical, Thermal, Mechanical, and Barrier Properties of Polymeric Packaging Materials. *Journal of Applied Polymer Science*. Vol. 115, 1742–1750. DOI: 10.1002/app.31244.
- Netramai, Siriyupa, Rubino, Maria, Auras, Rafael, Annous, Bassam. 2009. Mass Transfer Study of Chlorine Dioxide Gas through Polymeric Packaging Materials. *Journal of Applied Polymer Science*. Vol. 114, 2929–2936, DOI:10.1002/app.30869
- Auras, Rafael, Arroyo, Benjamin, Selke, Susan. 2009. Production and Properties of Spin-Coated Cassava-Starch-Glycerol-Beeswax Films. *Starch/Stärke*. Vol. 61 463–471. DOI 10.1002/star.200700701
- Madival, Santosh, Auras, Rafael, Singh, Sher Paul, Narayan, Ramani. 2009. Assessment of the Environmental Profile of PLA, PET and PS Clamshell Containers using LCA Methodology. *Journal of Cleaner Production*. 17: 1183. DOI:10.1016/j.jclepro.2009.03.015
- Bix, Laura, Bello, Nora, Auras, Rafael, Ranger, Jonathan, Lapinski, Maria. 2009. Examining the Conspicuousness and Prominence of Two Required Warnings on OTC Pain Relievers. *Proceedings of the National Academy of Sciences of the United States of America*. 106 (16): 6550-6555.
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- Lim, Loong-Tak, Auras, Rafael, Rubino, Maria. 2008. Processing technologies for poly(lactic acid). *Progress in Polymer Science*. 33 (8): 820-852. DOI:10.1016/j.progpolymsci.2008.05.004
- Qin, Yin, Rubino, Maria, Auras, Rafael, Lim, Loong-Tak. 2008. 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
- Kijchavengkul, Thitisilp, Auras, Rafael, Rubino, Maria, Ngouajio, Mathieu, Fernandez, Rodney T. 2008. Assessment of aliphatic-aromatic copolyester biodegradable mulch films. Part II: Laboratory simulated conditions. *Chemosphere* 71 (9): 1607-1616. DOI:10.1016/j.chemosphere.2008.01.037
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- Kijchavengkul, Thitisilp, Auras, Rafael. 2008. Compostability of polymers. *Polymer International*. 57 (6): 793-804. DOI: 10.1002/pi.2420.
- Kijchavengkul, Thitisilp, Auras, Rafael, Rubino, Maria. 2008. Measuring gel content of aromatic polyesters using FTIR spectrophotometry and DSC. *Polymer Testing*. 27 (1): 55-60. DOI:10.1016/j.polymertesting.2007.08.007
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- Qin, Yin, Rubino, Maria, Auras, Rafael, Lim, Loong-Tak. 2007. Use of a magnetic suspension microbalance to measure organic vapor sorption for evaluating the impact of polymer converting process. *Polymer Testing*. 26 (8): 1082-1089. DOI: 10.1016/j.polymertesting.2007.07.010.
- Kale, Gaurav, Kijchavengkul, Thitisilp, Auras, Rafael, Rubino, Maria, Selke, Susan. 2007. An Overview of Compostability of Bioplastic Packaging Materials. *Macromolecular Bioscience*. 7 (3): 255-277. DOI:10.1002/mabi.200600168.
- Almenar, Eva M., Auras, Rafael, Rubino, Maria, Harte, Bruce. 2007. A new technique to prevent main post harvest diseases in berries during storage: Inclusion complexes  $\beta$ -CD-Hexanal. *International Journal of Food Microbiology*. 118 (2): 164-172. DOI:10.1016/j.ijfoodmicro.2007.07.002
- Almenar, Eva M., Auras, Rafael, Wharton, Phillip, Rubino, Maria, Harte, Bruce. 2007. Release of acetaldehyde from  $\beta$ -CD inhibits postharvest decay fungi in vitro. *Journal of Agricultural and Food Chemistry*. 55: 7205-7217. DOI: 10.1021/jf071603y.
- Kijchavengkul, Thitisilp, Auras, Rafael, Rubino, Maria, Ngouajio, Mathieu, Fernandez, Rodney T. 2006. Development of an Automatic Laboratory-Scale Respirometric System to Measure Polymer Biodegradability. *Polymer Testing*. 25: 1006-1016. DOI:10.1016/j.polymertesting.2006.06.008
- Auras, Rafael, Bix, Laura. 2006. WAKE UP! The effectiveness of a student response system in large packaging classes. *Packaging Technology and Science*. 20 (3): 183-195. DOI:10.1002/pts.753
- Kale, Gaurav, Auras, Rafael, Singh, Sher Paul. 2006. Comparison of the Degradability of Poly(lactide) Packages in Composting and Ambient Exposure Conditions. *Packaging Technology and Science*. 40: 49-70. DOI: 10.1002/pts.742

- Kale, Gaurav, Auras, Rafael, Singh, Sher Paul. 2006. Degradation of Commercial Biodegradable Packages under Real Composting and Ambient Exposure Conditions. *Journal of Polymers and the Environment*. 14 (3): 317-334. DOI: 10.1007/s10924-006-0015-6
- Auras, Rafael, Singh, Sher Paul, Singh, Jay. 2006. Performance Evaluation of PLA against Existing PET and PS Containers. *Journal of Testing and Evaluation*. 34 (6): 530-536. DOI:10.1520/JTE100041
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