

## Curriculum Vitae – Raymond A. Pearson, Ph.D.

B. H. Barkalow & Associates, LLC  
65 West State Rd., Suite C  
Newaygo, Michigan 49337-8129  
231-652-2228 (phone)  
231-652-2299 (fax)  
[www.bhbi.com](http://www.bhbi.com)  
[Info@bhbi.com](mailto:Info@bhbi.com)

### **Educational Background:**

<b>Ph.D.</b> Materials Science & Engineering	University of Michigan Ann Arbor, MI	1990
<b>B.S.</b> Chemistry	University of New Hampshire Durham, New Hampshire	1980

### **Professional Experience:**

2016-present: B. H. Barkalow & Associates, Inc., Senior Materials Science Engineering Expert Consultant for hospitals, medical device companies, legal firms, and insurance carriers. Responsibilities consist of providing materials science client support which can include microscopic examinations of subject and exemplar devices for fracture as well as elemental analysis, reports of findings, as well as expert witness testimony.

2015-present: Lehigh University, Interim Associate Dean.

2001-present: Lehigh University, Center Director.

1990-present: Lehigh University, Professor.

1998-1999: Sandia National Laboratories, Faculty Sabbatical Staff Member.

1987- 1990: University of Michigan, Graduate Research Assistant.

1984-1987: GE Plastics Europe, Materials Specialist and Supervisor.

1980-1984: General Electric Corporate R & D Center, Associate Staff.

### **Honors and Awards:**

Hillman Award for Excellence in Undergraduate Student Advising, 2011

Fellow - Society of Plastics Engineers, 2010

ARKEMA Faculty Research Award 2006, 2007, 2008, 2009, 2010

IBM Faculty Research Award, 2005, 2006, 2007, 2009

Hillman Award for Excellence in Graduate Student Advising, 2005

IMAPS Best Paper of Session 1999, 2000 (2).

IMAPS Best Paper of Session, 1999.

ISHM Best Paper of Session Award, 1995.

ACS Polymer Curriculum Development Award, 1995.

ASMI (Lehigh Valley Chapter): Outstanding Young Member Award, 1994

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Navy-ASEE Summer Faculty Research Award, 1994

NSF Research Initiation Award, 1992.

### **Active Research Contracts:**

I have three projects that are active: 1) “Development of Sustainable SLS Powders based on PA-11” (PA-PMIP), 2) “Development of High-Temperature Adhesives Using Hybrid Nanoparticles” (PA-PITA), 3) “Application of Nanotechnology to Adhesive Systems For High Temperature Use (PA-PITA).

### **Past Research Contracts:**

A number of research contracts have been obtained from government and industrial sources totaling roughly \$6,000,000 and \$4,000,000, respectively.

For example, the National Science Foundation has funded such projects as “The Role of the Interface and the Interphase Region on the Toughening of Highly Crosslinked Epoxies,” “Solvent, Permeation, Swelling Profiles, and Mechanical Properties of Thin Polymer Films,” “GIT- Packaging Collaboration,” and “Enhanced Mechanical Properties Through Melt Manipulation.” Various DoD agencies have funded such projects as “Toughened High Temperature Polymer Composites” and “Thermal Analysis Instrumentation for Advanced Materials.” The state of Pennsylvania has funded such projects as “Assessing Flip Chip Technologies,” “Packaging Issues in Optoelectronics,” and “Application of Nanotechnology for Adhesives for MEMS.”

Company sponsored research includes projects funded by Abbott Labs, Arkema, Arrow International, Cabot, Dow Chemical, Elf –Aquitaine, Heatway, IBM, Intek, Intel, Metso Paper, Nortel Networks, Osaka Gas, and Zymet, Inc. Company sponsored consortia such as the Semiconductor Research Corporation (SRC) and SEMATECH have funded numerous projects on die attach adhesives and underfill resins for the past 20 years.

### **Editorships:**

American Chemical Society Symposium Series Volume 874, Polymers for Microelectronics and Nanoelectronics, Qinghuang Lin, Raymond A. Pearson, Jeffery C. Hedrick Editors, American Chemical Society: New York, 2004.

American Chemical Society Symposium Series Volume 759, Toughening of Plastics: Advances in modeling and Experiments, R. A. Pearson, H. J. Sue and A. F. Yee Editors, American Chemical Society: New York, 2000.

Materials Research Society, Symposium Proceedings Volume 515, Electronic Packaging Materials Science X, D. J. Belton, M. Gaynes, E. G. Jacobs, R. A. Pearson, and Tien Wu Editors, 1998.

Papers from the ANTEC ‘95 Symposium Sessions on Fracture and Failure of Plastics, R. A. Pearson and H.-J. Sue, Special Issue Editors, Polymer Engineering and Science, 36 (1996) pp 2269-2388. V

Papers from the ASME 1995 Int. Cong. Symposium on “Application of Fracture Mechanics in Electronic Packaging and Materials,” T. Wu, W. Chen, R. A. Pearson, and David Read Editors: ASME Intl. Mech. Eng. Congress and Exposition, November 1995, EEP-Vol. 11.

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### **Textbook Chapters:**

R. A. Pearson and Y. L. Liang, “Fracture behavior of hybrid epoxy-silica-rubber nanocomposites,” Chapter 23 in Physical properties and applications of polymer nanocomposites, S. C. Tjong and Y.-W Mai Editors, Woodhead Publishing: Philadelphia, 2010, pp 773-786.

Robert K. Oldak and R. A. Pearson, “Evaluation of Infrared Spectroscopic Techniques to Assess Molecular Interactions,” in Chapter 19 American Chemical Society Symposium Series Volume 874, Polymers for Microelectronics and Nanoelectronics, Qinghuannng Lin, Raymond A. Pearson, and Jeffery C. Hedrick Editors, American Chemical Society: New York, 2004, pp 251-263.

R. A. Pearson, “Thermosetting Adhesives,” In Encyclopedia of Materials: Science and Technology, Elsevier Press, (2001).

R. A. Pearson, “Thermosetting Plastics” in Applied Polymer Science – 21<sup>st</sup> Century, C, Carraher, and Clara Craver, eds, ACS: Washington D.C., 2000, p. 197.

R. A. Pearson, “Introduction to the Toughening of Polymers” in Chapter 1 American Chemical Society Symposium Series Volume 759, Toughening of Plastics: Advances in modeling and Experiments, R. A. Pearson, H. J. Sue and A. F. Yee Editors, American Chemical Society: New York, 2000.

M. F. DiBerardino and R. A. Pearson, “The Effect of Particle Size on Synergistic Toughening of Boron Nitride/Rubber Hybrid Epoxy Composites,” in Chapter 13 American Chemical Society Symposium Series Volume 759, Toughening of Plastics: Advances in Modeling and Experiments, R. A. Pearson, H. J. Sue and A. F. Yee Editors, American Chemical Society: New York, 2000.

R. A. Pearson and L. Pruitt, “Fatigue Crack Propagation in Polymer Blends” Chapter 27 in Polymer Blends: Formulation and Performance, D. R. Paul and C. B. Bucknall, eds, John Wiley and Sons: New York, 2000.

R. A. Pearson, “Impact Modifiers: (4) toughening agents for epoxy resins” in Plastics Additives: An A-Z Reference edited by G. Pritchard, Chapman-Hall: London, 1998, 406.

A. F. Yee and R. A. Pearson, “Fractography and Failure Mechanisms of Rubber-Modified Epoxide Resins,” Chapter 8 in Fractography: and Failure Mechanisms of Polymers and Composites, Editor: Anne C. Roulin-Maloney, Elsevier Science: New York, 1989, 291.

### **Publications (refereed):**

T. Gomez-del Rio, A. Salazar, R. A. Pearson, and J. Rodriguez, “Fracture behaviour of epoxy nanocomposites modified with triblock copolymers and carbon nanotubes,” Composites Part B 87 (2016) 343-349.

Bahereh T. Marouf, Yiu-Wing Mai, Reza Bagheri & Raymond A. Pearson, “Toughening of Epoxy Nanocomposites: Nano and Hybrid Effects,” Polymer Reviews, 56 (2016) 70-112.

Paul J. Brigandi, Jeffrey M. Cogen, Casey A. Wolf, John R. Reffner, Raymond A. Pearson, “Kinetic and thermodynamic control in conductive PP/PMMA/EAA carbon black composites,” J. Appl. Polym. Sci., 132 (2015) 42134.

Binay Patel, Raymond Pearson and Masashi Watanabe, “Bright Field and Dark Field STEM-IN-SEM Imaging of Polymer Systems,” J. Appl. Polym. Sci., 131 (2014) 40851.

T. Gomez-del Rio, J. Rodriguez and R. A. Pearson, “Compressive properties of nanoparticle

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- modified epoxy resin at different strain rates,” *Composites Part B: Engineering*, 57 (2014) 173-179.
- D.J. Bray , P. Dittanet F.J. Guild, A.J. Kinloch, K. Masania, R.A. Pearson, A.C. Taylor, “The modelling of the toughening of epoxy polymers via silica nanoparticles: The effects of volume fraction and particle size” *Polymer*, 54 (2013) 7022–7032.
- Thompson VP, Watson TF, Marshall GW Jr, Blackman BR, Stansbury JW, Schadler LS, Pearson RA, Libanori R., “Outside-the-(Cavity-prep)-Box Thinking,” *Adv Dent Res.*, 25(2013) 24-32.
- P.J. Brigandi, J. M. Cogen, R.A. Pearson, “Electrically Conductive Multiphase Polymer Blend Carbon-Based Composites,” *Polym. Eng. & Sci.*, 53 (2013) 1-16.
- P. Dittanet and R. A. Pearson, “Effect of bimodal particle size distributions on the toughening mechanisms in silica nanoparticle filled epoxy resin,” *Polymer*, 54 (2013) 1832-1835.
- P. Dittanet and R. A. Pearson, “Effect of silica nanoparticle size on toughening mechanisms of filled epoxy,” *Polymer* 53 (2012), 1890-1905.
- Isra H. Jaafar, Mohamed M. Ammar , Sabrina S. Jedlicka , Raymond A. Pearson, John P. Coulter, “Spectroscopic evaluation, thermal, and thermomechanical characterization of poly(glycerol-sebacate) with variations in curing temperatures and durations,” *J Mater Sci* (2010) 45:2525–2529.
- Y.L. Liang and R.A. Pearson, “The toughening mechanism in hybrid epoxy-silica-rubber nanocomposites (HESRNs), *Polymer*, 51 (2010) 4880-4890.
- Bagheri, R., Marouf, B. T. and Pearson, R. A. “Rubber-Toughened Epoxies: A Critical Review,” *Polymer Reviews*, 49: 3 (2009), 201–225.
- Y.L. Liang and R.A. Pearson, “Toughening mechanisms in epoxy–silica nanocomposites (ESNs),” *Polymer*, 50 (2009), 4895–4905.
- B.T. Marouf, R. A. Pearson and R. Bagheri, “Anomalous fracture behavior in an epoxy-based hybrid composite,” *Materials Science and Engineering A* 515 (2009), 49–58.
- Bahereh T. Marouf, Raymond A. Pearson and Reza Bagheri, “Observation of two  $\alpha$ -relaxation peaks in a nanoclay-filled epoxy compound,” *J Mater Sci*, 43 (2008) 6992–6997.
- Robert K. Oldak and Raymond A. Pearson, “Evaluation of infrared spectroscopic techniques to determine the Drago constants of a cycloaliphatic epoxy,” *J. Adhesion Sci. Technol.*, 21 (2007) 775–793.
- Ryan Hydro and Raymond A. Pearson, “Epoxies Toughened With Triblock Copolymers,” *Journal of Polymer Science Part B: Polymer Physics*, 45 (2007), 1470-1481.
- P. Hoontrakul and R. A. Pearson, “Surface reactivity of polyimide and its effect on adhesion to epoxy,” *J. Adhesion Sci. Technol.*, 20 (2006), 1905–1928.
- Brian J. McAdams and Raymond A Pearson, “Studies on the Disbonding Initiation of Interfacial Cracks,” Sandia Report SAND2005-4749 unlimited release, August 2005.
- W. Jeffrey Shakespeare, Raymond A. Pearson, Joachim L. Grenestedt, Paraoran Hutapea, and Vikas Gupta, “MEMS Integrated Submount Alignment for Optoelectronics,” *Journal of Lightwave Technology*, 23 (2005), 504-505.
- Orasa Khayankarn, Raymond A. Pearson, Nikhil Verghese, and Asjad Shafi, “Strength of Epoxy/Glass Interfaces after Hygrothermal Aging,” *The Journal of Adhesion*, 81(2005), 941–961.

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Brian J. McAdams and Raymond A. Pearson, "Initiation and Propagation of Delaminations at Underfill/Passivation Interfaces Relevant to Flip-Chip Assemblies," *IEEE Trans. DMR 2* (2004), 169-175.

Takafumi Kawaguchi and Raymond A. Pearson, "The moisture effect on the fatigue crack growth of glass particle and fiber reinforced epoxies with strong and weak bonding conditions: Part 2. A microscopic study on toughening mechanism," *Comp.Sci. & Tech.*, 64 (2004), 1991-2007.

Takafumi Kawaguchi and Raymond A. Pearson, "The moisture effect on the fatigue crack growth of glass particle and fiber reinforced epoxies with strong and weak bonding conditions: Part 1. Macroscopic fatigue crack propagation behavior," *Comp.Sci. & Tech.*, 64 (2004), 1981-1989.

Pat Hoontrakul, Les H. Sperling, and Raymond A. Pearson, "Understanding the Strength of Epoxy-Polyimide Interfaces for Flip-Chip Packages," *IEEE Trans. DMR 3* (2003), 1-8.

Takafumi Kawaguchi and Raymond A. Pearson, "The Effect of Particle-Matrix Adhesion on the Mechanical Behavior of Glass Filled Epoxies: Part 2 A Study on Fracture Toughness," *Polymer 44* (2003), 4239-4247.

Takafumi Kawaguchi and Raymond A. Pearson, "The Effect of Particle-Matrix Adhesion on the Mechanical Behavior of Glass Filled Epoxies: Part 1 A Study on Yield Behavior and Cohesive Strength," *Polymer 44* (2003), 4229-4238.

J.-C. Hsiung, R.A. Pearson, and T. B. Lloyd, "A Surface Energy Approach for Analyzing Die Attach Adhesive Resin Bleed," *J. Adhes. Sci. and Tech.*, 17 (2003), 1-14.

J. J. Goodelle, R. A. Pearson, and M. M. Santore, "Water-uptake in poly(methyl methacrylate) films with a fluorescent rotor probe," *J. Appl. Polym. Sci.*, 86 (2002), 2463-2471.

S. J. Hanley, A. M. Nesheiwat, R. T. Chen, M. Jamieson, R. A. Pearson, L.H. Sperling, "Phase Separation in Semi-Crystalline Blends of Poly(phenylene sulfide) and Poly(ethyleneterephthalate) II: Effect of poly(phenylene sulfide) Homopolymers Solubilization of PPS-graft-PET Copolymer on Morphology and Crystallization Behavior," *J. Polym. Sci. B: Polym Phys*, 38 (2000), 599-610.

R. Bagheri and R. A. Pearson, "Role of particle cavitation in rubber-toughened epoxies: II Inter-particle distance," *Polymer*, 41 (2000), 269-276.

S. Gupta, R. M. Hydro and R. A. Pearson, "Fracture Behavior of Isotropically Conductive Adhesives," *IEEE Trans. CMPT*, 22 (1999), 207-214.

R. A. Pearson, T. B. Lloyd and R. Bagheri, "Adhesion Issues at Epoxy Underfill / Solder Mask interfaces," *Journal of SMT*, 10 (1997), 31-36.

V. Nelliappan, E. S. Daniels, A. Klien, J. E. Roberts, R. A. Pearson and M. S. El-Aasser, "Effect of the Core/Shell Latex Particle Interphase on the Mechanical Behavior of Rubber-Toughened PMMA," *J. Appl. Polym. Sci.*, 65 (1997), 581-593.

R. A. Pearson, T. B. Lloyd, H. R. Azimi, J.-C. Hsiung, M.S. Early, and P. D. Brandenburger, "Adhesion Issues in Epoxy-Based Chip Attach Adhesives," *IEEE-CMPT*, 20 (1997) 31-37.

R. Hu, V. L. Dimonie, M. S. El-Aasser, R. A. Pearson, A. Hiltner, and S. G. Mylonakis, and L. H. Sperling, "Multicomponent Latex IPN Materials: 1. Morphology Control," *J. Polym. Sci. B: Polym. Phys.*, 35 (1997), 2193.

R. Hu, V. L. Dimonie, M. S. El-Aasser, R. A. Pearson, A. Hiltner, and S. G. Mylonakis, and L. H. Sperling, "Multicomponent Latex IPN Materials: 2. Dampening and Mechanical Behavior," *J.*

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*Polym. Sci. B: Polym. Phys.*, 35 (1997), 1501-1513.

R. Bagheri and R. A. Pearson, "Use of Surface Modified Recycled Rubber Particles for Toughening Epoxy Polymers," *Polym. Eng. Sci.*, 37 (1997), 245-251.

J. Y. Qian, R. A. Pearson, V. L. Dimonie, and M. S. El-Aasser, "The Role of Dispersed Phase Morphology on Toughening of Epoxies," *Polymer*, 38 (1997), 21-30.

R. Bagheri and R. A. Pearson, "Role of Blend Morphology in Rubber-Toughened Polymers," *J. Mater. Sci.*, 31 (1996), 3945-3954.

H. R. Azimi, R. A. Pearson, and R. Hertzberg, "Fatigue of Hybrid Epoxy Composites: epoxies containing rubber and hollow glass spheres," *Polym. Eng. and Sci.*, 36 (1996), 2352-2365.

R. Bagheri and R. A. Pearson, "Role of Particle Cavitation in Rubber-Toughened Epoxies: I. Microvoid Toughening," *Polymer*, 31 (1996), 4529-4538.

H. R. Azimi, R. A. Pearson, and R. Hertzberg, "Fatigue of Rubber-Modified Epoxies: effect of particle size and volume fraction," *J. Mater. Sci.*, 31, (1996), 3777-3789.

O. Shaffer, R. Bagheri, J. Y. Qian, El-Aasser, and R. A. Pearson, "Characterization of the Particle-Matrix Interface in Rubber-Modified Epoxy by Atomic Force Microscopy," *J. Appl. Polym. Sci.*, 58 (1995), 465-484.

R. Hu, V. L. Dimonie, M. S. El-Aasser, R. A. Pearson, L. H. Sperling, A. Hiltner, and S. G. Mylonakis, "Interfacial Aspects of Latex IPN's for Toughening Polycarbonate 1. Synthesis and Characterization," *J. Appl. Polym. Sci.*, 58 (1995), 375-384.

R. Bagheri and R. A. Pearson, "On the Use of Microvoids to Toughen Polymers," *Polymer*, 36 (1995), 4883-4885.

R. Bagheri and R. A. Pearson, "Interfacial Studies in CTBN-Modified Epoxies," *J. Appl. Polym. Sci.*, 58 (1995), 427-437.

J. Y. Qian, R. A. Pearson, V. L. Dimonie, and M. S. El-Aasser, "Synthesis and Application of Core/Shell Particles as Toughening Agents for Epoxies," *J. Appl. Polym. Sci.*, 58 (1995), 439-448.

H. R. Azimi, R. A. Pearson, and R. Hertzberg, "Role of Crack-Tip Shielding Mechanisms in Fatigue of Hybrid Epoxy composites Containing Rubber and Solid Glass Spheres," *J. Appl. Polym. Sci.*, 58 (1995), 449-463.

T. R. Clark, R. W. Hertzberg, N. Mohammadi, and R. A. Pearson, "The Mw/R-ratio Effect: Influence of Plasticizing and Testing Temperature on the Fatigue Response of PMMA," submitted to *J. Mater. Sci.*, Jan. 1995.

W. Fabianowski, R. J. Jaccodine, R. A. Pearson and P. Smektala, "Coupling Monolayers for Protection of Microelectronic Circuits," *Advanced Materials for Optics and Electronics*, 5 (1995), 199-213.

H. R. Azimi, R. A. Pearson, and R. Hertzberg, "Effect of Rubber- Plastic Zone Interactions on Fatigue Crack Propagation Behavior of Rubber-Modified Epoxy Polymers," *J. Mater. Sci. Lett.*, 13 (1994), 460-464.

R. A. Pearson, "Toughening Epoxies Using Rigid Thermoplastic Particles: A Review," *ACS Adv. Chem. Ser.*, 233 (1993), 405-425.

R. A. Pearson and A. F. Yee, "Toughening Mechanisms in Thermoplastic-Modified epoxies Part I:

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Modification Using PPO,” *Polymer*, 34 (1993), 3658-3670.

R. A. Pearson and A. F. Yee, “The Preparation and Morphology of PPO-Epoxy Blends,” *J. Appl. Polym. Sci.*, 48 (1993), 1051-1060.

H. J. Sue, R. A. Pearson and A. F. Yee, “Mechanical Modeling of Initiation of Localized Yielding Under Plane Stress Conditions in Rigid-Rigid Polymer Alloys,” *Polym. Eng. Sci.*, 31 (1991), 793-802.

R. A. Pearson and A. F. Yee, “The Influence of Particle Size and Particle Size Distribution on the Toughening Mechanism in Rubber-Modified Epoxy,” *J. Mater. Sci.*, 26 (1991), 3828-3844.

R. A. Pearson, Ph. D thesis: “Sources of Toughness in Modified Epoxies,” University of Michigan, August 1990.

R. A. Pearson and A. F. Yee, “Toughening Mechanism in Elastomer-Modified Epoxies-Part 3: Effect of Cross-Link Density,” *J. Mater. Sci.*, 24 (1989), 2571-80.

R. A. Pearson and A. F. Yee, “Toughening Mechanism in Elastomer-Modified Epoxy Resins - Part 2: Microscopy Studies,” *J. Mater. Sci.*, 21 (1986), 2475-88.

A. F. Yee and R. A. Pearson, “Toughening Mechanism in Elastomer-Modified Epoxy Resins - Part 1: Mechanical Studies,” *J. Mater. Sci.*, 21 (1986), 2462-74.

### **Publications (Conference Papers):**

R. A. Pearson and Yilin Chen, “On the Use of Self-Assembling Blockcopolymers to Toughen an Aromatic Amine-Cured Epoxy,” SPE ANTEC Meeting in Orlando, FL, March 2015.

Raymond A. Pearson, Amelia Labak, and Daniel Davies, “Fracture Behavior of Epoxy-Matrix Hybrid Nanocomposites” in the Proceedings of the 38th Annual Meeting of the Adhesion Society in Savannah, GA, February 2015. **(Keynote)**

Raymond A. Pearson, Lauren Bacigalupo, Dan Davies, Binay Patel, Eugene Step and Angelica Sanchez, “Fracture Behavior of Silica Nanoparticle Filled Epoxies: The Influence of Particle-Matrix Adhesion” in the Proceedings of the 37<sup>th</sup> Annual Meeting of the Adhesion Society in San Diego, CA, February 2014.

Yilin Chen and Raymond A. Pearson, “On the Use of Self-Assembling Block Copolymers to Toughen A Model Epoxy” in the Proceedings of the 37<sup>th</sup> Annual Meeting of the Adhesion Society in San Diego, CA, February 2014.

Amelia Labak and Raymond A. Pearson, “Block Copolymer Modified Epoxies: The Effect of Resin Chemistry on Morphology” in the Proceedings of the 37<sup>th</sup> Annual Meeting of the Adhesion Society in San Diego, CA, February 2014.

Lauren N. Bacigalupo and Raymond A. Pearson, “Predicting the Fracture Toughness of Rubber Modified Epoxy,” in the Proceedings of the 36<sup>th</sup> Annual Meeting of the Adhesion Society in Daytona Beach, FL, March 2013.

Yilin Chen and Raymond A. Pearson, “Epoxies Toughened with Self-Assembling Block Copolymers,” in the Proceedings of the 36<sup>th</sup> Annual Meeting of the Adhesion Society in Daytona Beach, FL, March 2013.

Daniel W. Davies and Raymond A. Pearson, “Fracture Behavior of Epoxy-Based Hybrid Composites,” in the Proceedings of the 36<sup>th</sup> Annual Meeting of the Adhesion Society in Daytona

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Beach, FL, March 2013.

Amelia Labak and Raymond A. Pearson, “Modifying the Network of an Aromatic Amine-Cured Epoxy,” in the Proceedings of the 36<sup>th</sup> Annual Meeting of the Adhesion Society in Daytona Beach, FL, March 2013

Raymond A. Pearson, Peerapan Dittanet and Yi-Ling Liang, “Fracture Mechanisms in Hybrid, Particulate Composites,” in the Proceedings of the 35<sup>th</sup> Annual Meeting of the Adhesion Society in New Orleans, LA, February 2012.

Lauren N. Bacigalupo and Raymond A. Pearson, “Predicting the Fracture Toughness of Rubber Modified Epoxy Nanocomposites,” in the Proceedings of the 35<sup>th</sup> Annual Meeting of the Adhesion Society in New Orleans, LA, February 2012.

Timothy M. Prozonic and Raymond A. Pearson, “Toughenability of Epoxies: The Role of Crosslink Density vs. Average Functionality of Crosslinks,” in the Proceedings of the 35<sup>th</sup> Annual Meeting of the Adhesion Society in New Orleans, LA, February 2012.

R. A. Pearson and L. N. Bacigalupo, “Epoxies toughened with self-assembling block copolymers,” ACS 241<sup>st</sup> National Meeting in Anaheim, CA: March 2011. **(Invited)**

R. A. Pearson and L. N. Bacigalupo, “Epoxy Polymers Toughened by Self-Assembling Block Copolymers,” SPE ANTEC Meeting in Boston, MA: May 2011.

Timothy M. Prozonic and Raymond A. Pearson, “Improving the Toughenability of Inhomogeneously Crosslinked Epoxy Resins with Bimodal Molecular Weight Distributions,” in the Proceedings of the 34<sup>th</sup> Annual Meeting of the Adhesion Society in Savannah, GA, February 2011.

Adam R. Kohn and Raymond A. Pearson, “Rheological Behavior of Nanosilica Filled Epoxies,” in the Proceedings of the 34<sup>th</sup> Annual Meeting of the Adhesion Society in Savannah, GA, February 2011.

Raymond A. Pearson and Sepideh Khoei, “Effect of Bondline thickness on Adhesive Strength in Rubber-Toughened Epoxies,” in the Proceedings of the 34<sup>th</sup> Annual Meeting of the Adhesion Society in Savannah, GA, February 2011.

L. N. Bacigalupo and R. A. Pearson, “On the Use of Triblock Copolymers to Toughen Epoxy Resins,” in Proceedings of the 33<sup>rd</sup> Annual Meeting of the Adhesion Society in Daytona Beach, FL, February 2010, pp. 147-149.

Peerapan Dittanet and Raymond A. Pearson, “Fracture Behavior of Silica-Filled Epoxies: Effect of Bimodal Particle Size Distributions,” in Proceedings of the 33<sup>rd</sup> Annual Meeting of the Adhesion Society in Daytona Beach, FL, February 2010 pp. 89-91.

Raymond A. Pearson, “Hydrolytic Stability of Glass-Epoxy Interfaces,” presented at IBM PCB Symposium in East Fishkill, NY, November 2009.

R. A. Pearson P. Dittanet, L. Bacigalupo, Y.-L. Liang and R. Oldak, “On the Use of Nanoscale Materials to Toughen Model Epoxies,” in Proceedings of the 42<sup>nd</sup> IMAPS International Symposium on Microelectronics in San Jose, CA, November 2009.

Raymond A. Pearson and Salvatore S. Cimorelli, “Modeling Residual Stresses in Epoxies During Cooling,” in Proceedings of the 42<sup>nd</sup> IMAPS International Symposium on Microelectronics in San Jose, CA, November 2009.

R. A. Pearson, L. N. Bacigalupo, Y.L. Liang, B. T.-Marouf, and R. K. Oldak, “Epoxy Thermosets



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Toughened with Triblock Copolymers,” SPE ANTEC Meeting in Chicago, IL, June 2009.

Tawat Soitong, Jantrawan Pumchusak and Raymond A. Pearson, “The fracture behavior of short-fiber reinforced epoxies,” in Proceedings of the 32<sup>nd</sup> Annual Meeting of the Adhesion Society in Savannah, GA, February 2009.

Peerapan Dittanet and Raymond A. Pearson, “Effect of nanosilica particle size on the toughening mechanisms in a ductile epoxy resin,” in Proceedings of the 32<sup>nd</sup> Annual Meeting of the Adhesion Society in Savannah, GA, February 2009.

R. A. Pearson, L. N. Bacigalupo, Y.L. Liang, B. T.-Marouf, and R. K. Oldak,” On the Use of Nanoscale Materials to Toughen Epoxy Resins,” in Minnowbrook 2008 Packaging Conference, Blue Mountain Lake, NY, October 2008.

R. A. Pearson, L. N. Bacigalupo, Y.L. Liang and R. K. Oldak, “Toughening Mechanisms in Epoxy Matrix Hybrid Composites/Nanocomposites” SPE AUTOMOTIVE COMPOSITES CONFERENCE & EXHIBITION (ACCE) in Detroit, MI, September 2008.

Yi-Ling Liang and Raymond A. Pearson, “Toughening Mechanisms in Epoxy-Based Hybrid Nanocomposites,” in POLY Preprints Fall ACS Meeting in Philadelphia, PA, August 2008.

R. A. Pearson, L. N. Bacigalupo, Y.L. Liang, B. T.-Marouf, and R. K. Oldak, “On the Use of Nanoscale Toughening Agents to Improve the Flaw Tolerance of Epoxies,” in Proceedings of NANOTECH 2008 in Boston, MA, June 2008.

B. T. Marouf, R. A. Pearson and R. Bagheri, “Epoxy Toughened Using Combination of Nanoclay Layers and Rubber Particles,” 2<sup>nd</sup> International Conference on Nanostructures, March 11-14, Kish University, Kish Island, Iran, 2008, 319. **(Invited Talk)**

Y. L. Liang and R. A. Pearson, “The Role of Nanosilica Dispersion and Particle Size in Hybrid Epoxy-Silica Nanocomposites Toughening Mechanism,” in Proceedings of the 31<sup>st</sup> Annual Meeting of the Adhesion Society in Austin, TX, February 2008, pp 364-366.

B.T. Marouf, R. A. Pearson and R. Bagheri, “Toughening Mechanisms in Montmorillonite-Rubber-Epoxy Hybrid Nanocomposites,” in Proceedings of the 31<sup>st</sup> Annual Meeting of the Adhesion Society in Austin, TX, February 2008, pp. 103-105.

R. A. Pearson, L. N, Bacigalupo, Y. L. Liang, B.T. Marouf and R. K. Oldak, “Plastic Zone Size-Fracture Toughness Correlations in Rubber-Modified Epoxies,” in Proceedings of the 31<sup>st</sup> Annual Meeting of the Adhesion Society in Austin, TX, February 2008, pp. 27-29.

Raymond Pearson, Robert Oldak and Yi-Ling Liang, “On the Use of Nanoparticles to Toughen Epoxy Resins,” in Commercialization of Nanomaterials 2007 in Pittsburg, PA, November 2007 – Abstract & Oral Presentation.

Raymond A. Pearson,” Moisture Ingress in Hollow Plastic Packages,” in Minnowbrook 2007 Packaging Conference, Blue Mountain Lake, NY, October 2007.

B. T.-Marouf, R. Bagheri and R. A. Pearson,” Effect of Nanoclay on Mechanical Behavior of Rubber-Epoxy Blends” in 8<sup>th</sup> International Seminar on Polymer Science and Technology (ISPST), Tehran, Iran, 2007.

B. T.-Marouf, R. Bagheri and R. A. Pearson,” Fracture Mechanism of Layered-Silicates/Epoxy Nanocomposites” in 8<sup>th</sup> International Seminar on Polymer Science and Technology (ISPST), Tehran, Iran, 2007.

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B. T.-Marouf, R. Bagheri and R. A. Pearson, "Effect of Nanoclay on Relaxation Behavior in Epoxy Resins" in 8<sup>th</sup> International Seminar on Polymer Science and Technology (ISPST), Tehran, Iran, 2007.

Robert K. Oldak, Ryan M. Hydro and Raymond A. Pearson, "On the Use of Triblock Copolymers as Toughening Agents for Epoxies," in Proceedings of the 30<sup>th</sup> Annual Meeting of the Adhesion Society in Tampa Bay, FL, February 2007, pp. 153-155.

Y. L. Liang and R. A. Pearson, "The Effect of Surface Contamination on Polyimide-Epoxy Adhesion," in Proceedings of the 30<sup>th</sup> Annual Meeting of the Adhesion Society in Tampa Bay, FL, February 2007, pp. 243-244.

Peerapan Dittanet, Melania Doll and Raymond A. Pearson, "On the Use of Nanosilica Fillers in Epoxy Resins," in Proceedings of the 30<sup>th</sup> Annual Meeting of the Adhesion Society in Tampa Bay, FL, February 2007, pp. 334-336.

Y. L. Liang, R. K. Oldak and R. A. Pearson, "Particle Size Effect in Rubber-Glass Sphere Toughened Epoxies," in Proceedings of the 30<sup>th</sup> Annual Meeting of the Adhesion Society in Tampa Bay, FL: February 2007, pp. 343-245.

Xiaohan Zhang and Raymond A. Pearson, "Investigating the Use of Organosilane-Based Adhesion Promoters to Strengthen Glass/Epoxy Interfaces," in Proceedings of the 30<sup>th</sup> Annual Meeting of the Adhesion Society in Tampa Bay, FL: February 2007, pp. 413-415.

Ryan M. Hydro and Raymond A. Pearson, "Developing Conductive Adhesives for MEMS Applications," in Proceedings of the 29<sup>th</sup> Annual Meeting of the Adhesion Society in Jacksonville, FL, February 2006, p. 200.

Brian J. McAdams and Raymond A. Pearson, "A New Approach for Predicting the Onset of Disbonds in Flip-Chip Applications," in Proceedings of the 29<sup>th</sup> Annual Meeting of the Adhesion Society in Jacksonville, FL, February 2006, p. 202.

Raymond A. Pearson and Brian J. McAdams, "Characterizing Disbond Initiation Resistance." in the Proceedings of the IMAPS International Conference and Exhibition on Device Packaging, Scottsdale, AZ, March 2006 Paper WP23.

Jason, T. Iceman, Raymond A. Pearson, Richard p. Vinci, and Svetlana Tatic-Lucic, "MEMS Fiber Optical Aligner: Characterization and Engineering." in the Proceedings of the IMAPS International Conference and Exhibition on Device Packaging, Scottsdale, AZ, March 2006 Paper WA13.

Raymond A. Pearson and Thomas Daugherty, "Evaluating the Dimensional Stability of Optoelectronic Adhesives." in the Proceedings of the IMAPS International Conference and Exhibition on Device Packaging, Scottsdale, AZ, March 2006 Paper TP41.

Raymond A. Pearson, Rajesh R. Gomatam, Jessica Goodell, Jason Iceman, and John P. Coulter. "Model LCP-Based Packages for Optoelectronic Devices" in the Proceedings of the IMAPS International Conference and Exhibition on Device Packaging, Scottsdale, AZ, March 2006 Paper TA15.

Raymond A. Pearson, Thomas Daugherty, and Bob Sullivan: "Evaluating the Dimensional Stability of Optoelectronic Adhesives Using Test Vehicles," IMAPS Proceedings of the 2005 International Symposium on Microelectronics, pp. 300-303, 2005.

Jason T. Iceman, Raymond A. Pearson, Richard P. Vinci, Svetlana Tatic-Lucic: "MEMS Fiber Optic Aligner: Characterization and Engineering," IMAPS Proceedings of the 2005 International

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Symposium on Microelectronics, pp. 291-299, 2005.

Raymond A. Pearson and Brian J. McAdams, “Interfacial Interactions and Fracture of Polyimide-Epoxy Interfaces,” in PMSE Preprints Fall ACS Meeting in Washington, DC, August 2005, volume 93.

Raymond A. Pearson and Brian J. McAdams, “A New Approach for Predicting the Onset of Disbonds in Flip-Chip Assemblies,” in the Proceedings of 2005 Spring MRS Meeting in San Francisco, CA, April 2005.

Raymond A. Pearson and Brian J. McAdams, “Disbond Initiation Studies Involving Underfill/Passivation Interfaces,” in PMSE Preprints Spring ACS Meeting in San Diego, CA, March 2005, volume 92.

Orasa Khayankarn and Raymond A. Pearson, “Organosilanes as Adhesion Promoters for Thermal and UV Cured Epoxies: Adhesive Strength on Glass Surfaces After Hygrothermal Aging,” in Proceedings of the 28<sup>th</sup> Annual Meeting of the Adhesion Society in Mobile, AL, February 2005, pp. 486-488.

M.S. Kent, H. Yim, D. Read, W. Yuen, E. D. Reedy, B. McAdams, R. Pearson, and B.S. Majumdar, “The Relationship Between Interfacial interactions and Crack initiation: Effect of Singular Stress Field,” in Proceedings of the 28<sup>th</sup> Annual Meeting of the Adhesion Society in Mobile, AL, February 2005, pp. 226-228.

W. Jeffery Shakespeare, Raymond A. Pearson, Joachim Grenestedt, Parsaran Hutapea, and Vikas Gupta, “MEMS Integrated Submount Alignment for Optoelectronics,” IMAPS ATW on Optoelectronic Device Packaging and Materials in Bethlehem, PA, October 2004.

Raymond A. Pearson and O. Khayankarn, “Stability of Epoxy Glass Interfaces,” IMAPS ATW on Optoelectronic Device Packaging and Materials in Bethlehem, PA, October 2004.

Brian J. McAdams and Raymond A. Pearson, “Strength of Underfill-Passivation Interfaces,” IMAPS ATW on Optoelectronic Device Packaging and Materials in Bethlehem, PA, October 2004.

Raymond A. Pearson and Kim Trapp, “Optoelectronic Packaging Thrust Group Overview,” Center for Optical Technologies at Lehigh University,” IMAPS ATW on Optoelectronic Device Packaging and Materials in Bethlehem, PA, October 2004.

Raymond A. Pearson and Guy Connelly, “Characterizing Adhesives for Optoelectronics.” Proceedings of the Polytronic Conference, Portland, Oregon, September 2004. **(Invited)**

Brian J. McAdams and Raymond A. Pearson, “Application of Critical Stress Singularity Factors to Evaluate Underfill/Passivation Interfaces.” Proceedings of the Polytronic Conference, Portland, Oregon, September 2004.

Ryan M. Hydro, Raymond A. Pearson, John P. Coulter, David C. Angstadt, and Rajesh Gomatam, “Assessing Vibration-Assisted Injection Molding Through Fatigue Lifetime Studies,” ANTEC ‘04 Conf. Proceedings, Chicago, IL, May 2004.

R. A. Pearson, P. Hoontrakul, B. J. McAdams, R. K. Oldak, X. Zhang, “Epoxy/polyimide adhesion studies,” ACS Symposium on Polymers in Micro- and Nano- Electronics, Anaheim, CA, April 2004. **(Invited)**

M. S. Kent, H. Yim, J. Sorenson, A. Matheson, E. D. Reedy, B. S. Majumdar, B. J. McAdams, R. A. Pearson, “Using Self-Assembled Monolayers to Explore the Relationship Between Interfacial Interactions and Fracture in Structure Adhesive Joints,” ACS Symposium on Polymers in Micro- and

## Curriculum Vitae – Raymond A. Pearson, Ph.D.

Nano- Electronics, Anaheim, CA, April 2004. **(Invited)**

Raymond A. Pearson and Robert Oldak, “Predicting the strength of underfill/polyimide interfaces,” Proceedings of the 9<sup>th</sup> International Symposium on Advanced Packaging Materials: Processes, Properties and Interfaces, March 2004, pp. 264-266.

Raymond A. Pearson and Brian J. McAdams, “Initiation and propagation of delaminations at the underfill/passivation interface in flip-chip assemblies.” Proceedings of the 9<sup>th</sup> Symposium on Advanced Packaging Materials: Processes, Properties and Interfaces, March 2004, pp. 264-266.

Raymond A. Pearson and Guy Connelly, “Dimensional stability of optoelectronic adhesives,” Proceedings. Proceedings of the 9<sup>th</sup> International Symposium on Advanced Packaging Materials: Processes, Properties and Interfaces, March 2004, pp. 21-24.

Robert K. Oldak and Raymond A. Pearson, “Using Drago Constants to Predict Adhesion of Epoxies to Polyimides,” in Proceedings of the 27<sup>nd</sup> Annual Meeting of the Adhesion Society in Wilmington, NC: February 2004, pp. 370-372.

Xiaohan Zhang and Raymond A. Pearson, “Effect of Moisture on Disbond Initiation,” in Proceedings of the 27<sup>th</sup> Annual Meeting of the Adhesion Society in Wilmington, NC: February 2004, pp. 250-253.

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D. J. Welsh, R. A. Pearson, S. Luo, and C. P. Wong, “Fundamental Study on Adhesion Improvement for Underfill Using Adhesion,” in Proceedings of 51<sup>st</sup> IEEE-ECTC Meeting in Orlando, FL: June 2001.

Raymond A. Pearson, David J. Welsh, Robert O. Oldak, and B. J. McAdams, “Application of Flow Microcalorimetry to Develop Underfill Resins,” in Proceedings of the International Symposium and Exhibition on Advanced Packaging Materials: Processes, Properties and Interfaces in Braselton, GA: March 2001, pp. 386-388.

Donna Narsavage-Heald and Raymond A. Pearson, “Effect of Adhesion Promoters on the Wet Adhesive Strength of Epoxy to Glass,” in Proceedings of the 24<sup>th</sup> Annual Meeting of the Adhesion Society in Williamsburg, VA: February 2001, pp. 383-385.

David J. Welsh and Raymond A. Pearson, “Applications of Flow Microcalorimetry to Adhesion Issues in Microelectronics,” in Proceedings of the 24<sup>th</sup> Annual Meeting of the Adhesion Society in Williamsburg, VA: February 2001, pp. 128-130.

Raymond A. Pearson and Robert K. Oldak, “Development of Spectroscopic Techniques to Assess Molecular Interactions,” in Proceedings of the 24<sup>th</sup> Annual Meeting of the Adhesion Society in Williamsburg, VA: February 2001, pp. 125-127.

Brian J. McAdams and Raymond A. Pearson, “Adhesion and Deformation at the Underfill/polyimide Interface,” in Proceedings of the 24<sup>th</sup> Annual Meeting of the Adhesion Society in Williamsburg, VA: February 2001, pp. 104-106.

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R. A. Pearson, and P. Komnopad, “Adhesion Studies of Model Epoxy Systems and Commercial Underfill Resins,” in Proceedings of the International Symposium and Exhibition on Advanced Packaging Materials: Processes, Properties and Interfaces in Braselton, GA: March 1999, pp. 83-87.

R. A. Pearson, J. Taweplengsangsuksue, J. A. Emerson, and C. L. Jones “Development of Processing Diagrams for Underfill Resins,” in Proceedings of the International Symposium and Exhibition on Advanced Packaging Materials: Processes, Properties and Interfaces in Braselton, GA: September 1999, pp. 83-87.

J. A. Emerson, J. Benkoski, G. V. Miller, and R. A. Pearson, “Adhesion Studies at Die Attach Epoxy – Copper Leadframe Interfaces,” in Proceedings of the 22<sup>nd</sup> Annual Meeting of the Adhesion Society in Panama City Beach, FL : February 1999, pp. 143-145.

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J. Taweplengsangsuksue and R. A. Pearson, “Processing-Adhesion Relations for Die Attach Adhesives and Underfill Resins,” in Proceedings of the 3<sup>rd</sup> International Conference on Adhesive Joining and Coating Technology in Electronics Manufacturing in Binghamton, New York: September 1998, pp. 160.

S. Gupta, R. M. Hydro, and R. A. Pearson, “Fracture Behavior of Isotropically Conductive Adhesives,” in Proceedings of the 3<sup>rd</sup> International Conference on Adhesive Joining and Coating Technology in Electronics Manufacturing in Binghamton, New York: September 1998, pp. 38.

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A. O. Ayhan, H. F. Nied and R. A. Pearson, “Three-Dimensional Interface Fracture Models for Semiconductor Packages,” SRC TECHON ‘98 in Las Vegas, NV: September 1998, Paper 6.11.

J. Taweplengsangsuksue and R. A. Pearson, “Processing Diagrams for Underfill Resins,” SRC TECHON ‘98 in Las Vegas, NV: September 1998, Paper 2.10.

R. A. Pearson and M. F. DiBerardino, “On Plastic Zone Growth in BM-Filled, Rubber-Modified Epoxy Polymers,” *Polym. Mater. Sci. Eng.*, 79 (1998) pp. 201-202.

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J. Taweplengsangsuksue, J.-C. Hsiung and R. A. Pearson, “Modeling the Die Attach Adhesives Process,” in *Proceedings of the 4<sup>th</sup> International Symposium and Exhibition on Advanced Packaging Materials: Processes, Properties and Interfaces* in Braselton, GA: March 1998, pp. 165.

R. A. Pearson, R. M. Hydro, T. B. Lloyd and H. F. Nied, “The Effect of Temperature and Humidity Exposure on Adhesion,” *ASME Intl. Mech. Eng. Congress and Exposition*: November 1997, EEP-Vol. 20, pp. 1-6.

R. M. Hydro, R. A. Pearson, B. Yildirim, and H. F. Nied, “Application of the Mixed-Mode Bending Fracture Test for Electronic Packaging Materials,” in *Abstract Proceedings of the SEM Spring Conference on Experimental Mechanics* in Seattle, WA: June 1997, pp. 21-22.

J.-C. Hsiung and R. A. Pearson, “Processing Diagrams for Polymeric Die Attach Adhesives,” in *Proceedings of 47<sup>th</sup> IEEE-ECTC Meeting* in San Jose, CA: May 1997.

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V. Nelliappan, E. S. Daniels, A. Klien, J. E. Roberts, R. A. Pearson and M. S. El-Aasser, “Influence of the Core/Shell Latex Particle Interphase on the Mechanical Properties of Rubber-Toughened PMMA Composites” in the *Proceedings of the AIChE Annual Meeting* in Chicago, IL: November 11-14, 1996.

R. A. Pearson, T. B. Lloyd, J.-C. Hsiung, M.S. Early, and S. Phattananarudee, “Moisture Issues in Epoxy-Based Chip Attach Adhesives” in *NIST 6th International Workshop on Moisture in Microelectronics*, Gaithersburg, MD: October 1996.

R. A. Pearson, T. B. Lloyd and R. Bagheri, “Adhesion Issues at Epoxy Underfill / Solder Mask Interfaces” in *Volume I of the Proceedings of the Technical Program of the Surface Mount International Conference* in San Jose, CA: September 10-12, 1996.

P. D. Brandenburger and R. A. Pearson, “Mixed Mode Fracture of Organic Chip Attachment Adhesives,” *ASME Intl. Mech. Eng. Congress and Exposition*: November 1995, EEP-Vol. 11, pp. 179-185.

R. A. Pearson, T. B. Lloyd, H. R. Azimi, J.-C. Hsiung, and P. D. Brandenburger, “Fundamentals of Adhesion, Manufacturability, and Reliability of Epoxy-Based Chip Attachment Adhesives,” *ASME Intl. Mech. Eng. Congress and Exposition*: November 1995, EEP-Vol. 11, pp. 55-62.

J. P. Goodelle, R. A. Pearson, and T. Y. Wu, “Interlaminar Fracture Toughness of a Glass-Filled FR-4 Epoxy Composite as a Function of Mode-Mixity,” *ASME Intl. Mech. Eng. Congress and*

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Exposition: November 1995, EEP-Vol. 11, pp. 163-169.

H. R. Azimi, T. B. Lloyd, and R. A. Pearson, "Fundamentals of Adhesion: The Utility of the Three-Liquid Probe Method," ASME Intl. Mech. Eng. Congress and Exposition, November 1995, EEP-Vol. 11, pp. 155-161.

S. K. Malik, R. Srinath, R. A. Pearson, R. Kodnani, J. Dzwilefsky, and A. Call, "Joint University-Industrial Project: Optimization of Process Windows for Chip Attachment Manufacturing Process," ISHM 1995, October 1995 (Best Paper of the Session Award).

P. H. Tsao, A. S. Voloshin and R. A. Pearson, "Residual Stresses in an Organic Die-Attach Adhesive," in "Mechanics of Time Dependent Materials" eds. I. Emri and W. G. Knauss. Proceedings of the 1st International Conference on Mechanics of Time Dependent Materials, 280-286, Ljubljana, Slovenia: September 11-13, 1995

R. A. Pearson and J. Mikitka, "The Effect of Cross-Link Density on the Growth of Shear Bands in Amine Cured Epoxy," 1995 ASME Intl. Mech. Eng. Congress and Exposition: November 1995.

H. R. Azimi, R. A. Pearson and R. W. Hertzberg, "A Mechanistic Understanding of Fatigue Crack Propagation of Rubber-Modified Epoxy Polymers" ANTEC '95 Conf. Proceed., 1995, 2, 1920-1924.

R. A. Pearson, H. R. Azimi, R. Bagheri, and Y. J. Qian, "Recent Advances in Rubber-Modified Epoxy Polymers," ANTEC '95 Conf. Proceed., 1995, 2, 2656-2660.

R. Bagheri and R. A. Pearson, "Epoxy Toughened With Hollow Latex Particles," 9th Int. Conf. on Deformation, Yield and Fracture of Polymers, Churchill College, Cambridge, UK, 1994, 9, P106-104.

R. Bagheri and R. A. Pearson, "Toughened Epoxy Polymers: The Role of Cavitation in Rubber-Toughened Epoxies," Polym. Mater. Sci. Eng., 1994, 70, 15-16.

J. Y. Qian, R. A. Pearson, V. L. Dimonie, and M. S. El-Aasser, "Epoxy Polymers Toughened with Novel Latex Particles," Polym. Mater. Sci. Eng., 1994, 70, 17-19.

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M. DiBerardino and R. A. Pearson, "Toughening Concepts for High Temperature Polymers," 25<sup>th</sup> Int. SAMPE Tech. Conf. Ser., 1993, 25, 502-513.

H. R. Azimi, R. A. Pearson, and R. Hertzberg, "Fatigue of Hybrid Composites," 25<sup>th</sup> Int. SAMPE Tech. Conf. Ser., 1993, 25, 665-679.

N. Mohammadi and R. A. Pearson, "Evaluation of Test Methods Used to Measure Interfacial Fracture Toughness of Bimaterial Interfaces," 25<sup>th</sup> Int. SAMPE Tech. Conf. Ser., 1993, 25, 655-664.

J. Goodelle, R. A. Pearson, and T. Wu (IBM), "The Characterization of Interfacial Fracture Toughness as a Function of Mode-Mixity for Glass-Filled Epoxy /Copper Laminates," 25<sup>th</sup> Int. SAMPE Tech. Conf. Ser., 1993, 25, 951-965.

Reza Bagheri and Raymond A. Pearson, "Rubber-Toughened Polymers: The Role of the Epoxy-Rubber Interface," SPE Tech. Papers, 1993, 39, 3006-3010.

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H.-R. Azimi, R. Hertzberg and Raymond Pearson, "Fatigue of Hybrid Composites," SPE Tech. Papers, 1993, 39, 1352-1356.

A. K. Smith, R. A. Pearson, and A. F. Yee, "Synergistic Toughening in Hybrid Composites," 50<sup>th</sup> SPE ANTEC meeting (1992) 2631-2634.

S. B. Tobing and R. A. Pearson, "On Toughening of Highly Crosslinked Epoxies," 50<sup>th</sup> SPE ANTEC meeting (1992) 2613-2615.

R. A. Pearson and A. F. Yee, "Sources of Toughness in Modified Epoxies," Polym. Mater. Sci. Eng., 1990, 63, 311-314.

H. J. Sue, R. A. Pearson, and A. F. Yee, in "ICF7: Advances in Fracture Research," Vol. 4, edited by K Samala, K. Ravi-Chander, D. M. R. Taplin and P. Rama Rao (Pergamon Press, New York, 1989).

H. J. Sue, R. A. Pearson, D. S. Parker, J. Huang and A. F. Yee, "Probing Toughening Mechanisms of Polymers Using a Double-Notch Four-Point-Bending Method," Polym Preprints, 1988, 29(2), 147.

R. A. Pearson and A. F. Yee, "The Effect of Crosslink Density on the Toughening Mechanism of Elastomer-Modified Epoxies," Polym. Mater. Sci. Eng., 1983, 49, 316-320.

### **International Conferences:**

B. Patel and R. A. Pearson, "Mapping Plastic Deformation at Crack Tips in a Silica Nanoparticle-Toughened Epoxy," Proceedings of the 16<sup>th</sup> International Conference on Deformation, Yield and Fracture of Polymers in Kerkrade, The Netherlands, April 2015.

R. A. Pearson, "Fracture behavior of epoxies toughened with acrylate-based block copolymers," 12<sup>th</sup> Int. Conf. on Fracture and Damage Mechanics: Alghero, Sardinia, Italy in September 2013. **(Keynote)**

R. A. Pearson, "Fracture behavior of hybrid, particulate composites," 15<sup>th</sup> Int. Conf. on Deformation, Yield and Fracture of Polymers: Rolduc Abbey, Kerkrade, The Netherlands, 2012.

L. Bacigalupo and R. A. Pearson, "Toughening of epoxies: comparing self-assembling block copolymers with core-shell particles and telechelic oligomers," 15<sup>th</sup> Int. Conf. on Deformation, Yield and Fracture of Polymers: Rolduc Abbey, Kerkrade, The Netherlands, 2012, 15.

R. A. Pearson, "On the Use of Nanotechnology to Toughen Epoxy Resins," 13<sup>th</sup> Int. Conf. on Deformation, Yield and Fracture of Polymers, Rolduc Abbey, Kerkrade, The Netherlands, 2006, 13, 129-132. **(Invited)**

J. Taweplengsangsuksue and R. A. Pearson, "Development of Processing Diagrams for Underfill Resins," in Proceedings of the 4<sup>th</sup> International Conference on Adhesive Joining and Coating Technology in Electronics Manufacturing in Espoo, Finland, June 2000, p. 174.

R. A. Pearson, "Adhesion Studies in Flip-Chip Assemblies," in Proceedings of the 4<sup>th</sup> International Conference on Adhesive Joining and Coating Technology in Electronics Manufacturing in Espoo, Finland, June 2000, p. 35.

R. A. Pearson, H. R. Azimi, R. Bagheri, J. Qian, and Y.-C. Huang, "Improving the Toughness of Epoxy Polymers by Tailoring the Properties of the Elastomeric Additives," 10<sup>th</sup> Int. Conf. on Deformation, Yield and Fracture of Polymers: Churchill College, Cambridge, UK, 1997, 10, 175-178.



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R. A. Pearson, T. B. Lloyd, H. R. Azimi, J.-C. Hsiung, M.S. Early, and P. D. Brandenburger, “Adhesion Issues in Epoxy-Based Chip Attach Adhesives,” in Proceedings of the 2nd Int. Conference on Adhesives in Electronics '96 in Stockholm, Sweden, June 3-5, 1996.

R. Bagheri and R. A. Pearson, “Epoxy Toughened With Hollow Latex Particles,” 9<sup>th</sup> Int. Conf. on Deformation, Yield and Fracture of Polymers: Churchill College, Cambridge, UK, 1994, 9, P106-104.

R. A. Pearson, A. K. Smith, and A. F. Yee, “Synergistic Toughening in Hybrid Composites,” 2nd Int. Conf. on Deformation and Fracture of Composites: Manchester, England (March 1993) 9:1-10.

H. Azimi, R. W. Hertzberg, and R. A. Pearson, “Fatigue Crack Propagation of Hybrid Epoxy Composites,” 2<sup>nd</sup> Int. Conf. on Deformation and Fracture of Composites: Manchester, England (March 1993) 37:1-10.

R. A. Pearson and A. F. Yee, “Toughening of Epoxies Using Rigid Thermoplastic Spheres” presented by R. A. Pearson at the 8th International Conference on Deformation, Yield, and Fracture of Polymers in Cambridge, England, 1991.

### **Invited Talks:**

Invited Seminar at Air Products and Chemicals, 2006.

Invited Seminar at Texas Instruments, 2006.

Invited Seminar at Delphi, 2005.

Invited Seminar at Cabot, 2005.

Invited Seminar at IBM, 2005.

Invited Seminar at National Starch, 2005.

Webcast to Intel in Chandler, AZ, June 2004.

Oral Presentation at Intel in Portland Oregon, September 2004.

HDPUG Program Review in Tempe, AZ, September 2004.

Invited Seminar at Epoxy Formulator's Conference, 2003.

Invited Seminar at GE-GRD, 2003.

Invited Seminar at Furon in Ohio, February 2000.

Invited Seminar at Epoxy Formulator's Conference in San Antonio, TX, April 2000.

Invited Seminar at Advanced Polymer Systems in Willow Grove, PA, May 2000.

Invited Seminar at 2<sup>nd</sup> International Symposium on Adhesive Joints in Newark, NJ, May 2000.

Invited Seminar at Chalmers University in Gothenburg, Sweden, June 2000.

Invited Seminar at Helsinki University of Technology in Espoo, Finland, June 2000.

Present Seminar to Intel Employees at SRC TECHON in Phoenix, AZ, September 2000.

Invited Seminar at International Symposium on Polymers in Microelectronics, Newark, NJ, October 2000.

R. A. Pearson, “Fracture Behavior of Underfill Resins and Their Application to Flip-Chip on

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Organic Assemblies,” to Advanced Micro Devices, Sunnyvale, CA, June 1999.

R. A. Pearson, “Fracture Behavior of Underfill Resins and Their Application to Flip-Chip on Organic Assemblies,” to the Intel Assembly Technology Development Technology and Manufacturing Group in Santa Clara, CA, June 1999.

R. A. Pearson, “Fracture Behavior of Underfill Resins and Their Application to Flip-Chip on Organic Assemblies,” to the Hewlett Packard Inkjet Business Group in Corvallis, OR, June 1999.

R. A. Pearson, “Fracture Behavior of BN/Rubber Hybrid Composites,” at the IAB-NSF review at the University of New Mexico in Albuquerque, NM, September 1998.

R. A. Pearson, “Interfacial Fracture Studies,” to the 28<sup>th</sup> Annual POLYMAC Meeting in Oak Ridge, TN, June 1998.

R. A. Pearson, “Processing Diagrams for Die Attach Adhesives,” IMAPS Mini-Symposium hosted at Bell Laboratories in Murray Hill, NJ, April 1998.

R. A. Pearson, “Adhesion Between Epoxy-Based Die Attach Adhesives and Copper Leadframes,” to IMRI and NUS in Singapore, January 1998.

R. A. Pearson, “Fracture Behavior of Toughened Epoxies,” to the Organic Materials Division of Sandia National Laboratories in Albuquerque, NM, November 1997.

R. A. Pearson, “New Routes To Improve The Toughness of rubber-Modified Epoxies,” at the Materials Science and Engineering Department at Cornell University in Ithaca, NY: November 1996.

R. A. Pearson, “The Relationships Between Blend Morphology and Fracture Toughness in Rubber-Modified Epoxy Polymers,” at the ACS North American Research Conference on Hilton Head Island, South Carolina, March 1996.

R. A. Pearson, “New Routes to Improve Toughness of Rubber-Modified Epoxies,” at The Intersociety Polymer Conference in Baltimore, Maryland, October 1995.

R. A. Pearson, “The Use of Fracture Mechanics in Plastic Packages” at the SEMATECH Package Modeling Workshop at SEMATECH, Austin, Texas, September 1995.

R. A. Pearson, “Developing Metrologies for Liquid Encapsulants” to SEMATECH Liquid Encapsulate Enhancement PTAB Committee, Austin, Texas, August 1995.

R. A. Pearson, “On the Use of Interfacial Fracture Mechanics in Plastic IC Packages,” at Advanced Micro Devices, Sunnyvale California, July 1995.

R. A. Pearson, “Delamination in Plastic IC Packages: Developing Preventive Strategies,” to SEMATECH Liquid Encapsulant Enhancement PTAB Committee, Austin, Texas, May 1995.

R. A. Pearson, “Fundamentals of Adhesion, Manufacturability, and Reliability of Epoxy-Based Chip Attachment Adhesives,” at Intel Corporation, Chandler, Arizona, February 1995.

R. A. Pearson, “Recent Advances in Rubber-Toughened Epoxy Polymers,” at Materials Research Society Meeting in Boston, Massachusetts, November 1994.

R. A. Pearson, “Toughening of Epoxy Polymers Using Structured Latex Particles,” at Lehigh University 24th Annual Emulsion Polymer Short Course, June 1993.

R. A. Pearson, “Rubber-Toughened Epoxy Polymers,” at Drexel University in Philadelphia, Pennsylvania, January 1993.

## Curriculum Vitae – Raymond A. Pearson, Ph.D.

R. A. Pearson, “Adhesion Issues in Non-Hermetic Packaging,” at the Digital Equipment Corporation in Hudson, Massachusetts, July 1992.

R. A. Pearson, “The Role of the Interface in Rubber-Toughened Epoxies” at the Amoco Chemical Company in Naperville, Illinois, May 1992.

R. A. Pearson, “The Role of the Interface in Rubber-Toughened Epoxies” at the Hercules Incorporated in Wilmington, Delaware, March 1992.

R. A. Pearson, “The Role of Particle Size and Particle Size Distribution in Rubber-Toughened Epoxies” at the Enichem America Inc. Princeton R&D Center in Mamouth Junction, New Jersey, November 1991.

R. A. Pearson, “The Influence of Particle Size and Particle Size Distribution on the Toughening Mechanism in Rubber-Modified Epoxy” at the Zeon Chemicals USA, Inc. in Louisville, Kentucky, September 1991.

R. A. Pearson, “Fracture and Fatigue in Hybrid Composites” at the Dow Chemical USA Co. in Freeport Texas, July 1991.

R. A. Pearson, “Rubber-Toughened Epoxies” at Elastomers Gordon Research Conference in New London, New Hampshire, July 1991.

R. A. Pearson, “Toughening of Polymers Structured Latex Particles” at the 22<sup>nd</sup> Annual Short Course: Advances in Emulsion Polymerization and Latex Technology in Bethlehem Pennsylvania, June 1991.

### **Patent:**

1986 Dutch Patent on “Easy Flow PC/PBT Blends” for GE Plastics.

### **Professional Society Memberships:**

American Chemical Society: Division of Polymer Chemistry

American Chemical Society: Division of Polymeric Materials Sci. & Eng.

American Society of Engineering Education

Society of Plastics Engineers

Society for the Advancement of Material and Process Engineering

### **Professional Activities:**

American Chemical Society: Division of Polymeric Materials Sci. & Eng.

Session Chair/Co-Organizer, Toughening of Plastics (1998)

Session Chair/Co-Organizer, Polymers in nano- and microelectronics (2002)

ASM International, Lehigh Valley Chapter

Chairperson, Young Member Committee (1995)

Member, Regional Technical Conference Committee (1994-95)

Member, Scholarship Committee (1992-95)

Liaison, Student Chapter (1992-94)

Chair, Student Outreach Committee (1991)

ASME, 1995 Intl. Mech. Eng. Congress and Exposition

## Curriculum Vitae – Raymond A. Pearson, Ph.D.

Session Chair/Organizer, Application of Fracture Mechanics in Electronic Packaging and Materials

IEEE, 4<sup>th</sup> International Conference on Adhesive Joining and Coating Technology in Electronic Manufacturing (2000) Session Chair

3<sup>rd</sup> International Conference on Adhesive Joining and Coating Technology in Electronic Manufacturing (1998) Session Chair and Workshop Organizer

IMAPS, Advance Packaging Materials Conference

2002 Session Chair/Co-Organizer – Process control

2001 Session Chair/Co-Organizer – Underfill Resins

2000 Session Chair/Co-Organizer – Encapsulants

1999 Session Chair/Co-Organizer – Process control

1998 Session Chair/Co-Organizer – Advanced Adhesive Materials

Keystone Chapter Board of Directors (2002-2012)

The Intersociety Polymer Conference

Session Chair: Design, Selection, & Application of Polyblends

National Science Foundation, Mechanics Division

Invited Panelist (July 1995)

Invited Panelist (July 1994)

Materials Research Society

Session Chair and Symposium Co-Organizer 1998

Session Chair 1996

NIST, Workshop on Materials Metrology for Electrical Packaging

Invited Participant (May 1994)

SRC, Topical Research Conference on Reliability

Session Chair, Co-Organizer, and Speaker, 1997

Session Chair and Co-Organizer, 1998

Session Chair, Co-Organizer, and Speaker, 2002

Society of Plastics Engineers

ANTEC 1995 Session Chair/Organizer, Fracture Mechanics Symposium

ANTEC 1998 Session Chair/Organizer Toughened Thermosets Symposium

On Executive Board of the Lehigh Valley Chapter (1996-present, President 2000)

Technical Program Chair for Polymer Nanocomposites Mini-Symposium (2006-2014)

Lehigh Valley Section Councilor (2012-present)

PMAD Board of Directors (2008-present)

PMAD Chair Elect (2014-present)

International Journal of Microelectronic Packaging: Materials & Technology

Reviewer (1994)

Technical Editorial Board (1994)

Consultant - Polymer Processing and Properties

Abbott Laboratories, Air Products and Chemicals, Benson and

Torres, INPACO, INTEL, Motorola, Loctite, W. L. Gore, etc.

Reviewer for various journals and textbooks

Journal of Applied Polymer Science, Polymer and Polymer Composites, Composite

## **Curriculum Vitae – Raymond A. Pearson, Ph.D.**

Science and Technology, IEEE-CPMT, Journal of Polymer Science Part B: Polymer Physics, Royal Chemical Society, etc.

### **Workshops**

Interfacial Fracture, Boston, MA 1998  
Polymers in Microelectronics, Binghamton, NY 1998  
Microelectronic Packaging, Singapore 1998  
Annual Microelectronic Packaging Materials Workshop, 1995-present

### **Internal Service:**

#### **University**

Faculty Development Council, 1995-1997.  
Graduate Research Committee, 2013-present.

#### **College**

Interim Associate Dean of Graduate Studies and Research, 2015-present  
Director, Polymer Science and Engineering graduate program, 2001-present  
ad hoc Student Professional Society Council, 1994.  
Undergraduate Curriculum Redesign Team, 1995.  
Tenure Committee, 1997, 1999.  
Faculty Search Committees, 2001, 2012.  
Freshman Advisor 1999, 2001, 2002.

#### **Department**

Faculty Search Committee, Biomaterials, 2007.  
Graduate Committee Member, 1994-1999, 2000-present.  
Graduate Admissions Coordinator, 1996-1998, 2000-present.  
Faculty Advisor to Student Materials Society, 1991-1995.  
Faculty Search Committee – Senior Microscopist, 1994.  
Junior Year Processing Lab Committee, 1994-1998.  
Undergraduate Coop Committee, 1994-1995.  
Innovations in Education Committee, 1996.  
Faculty Search Committee – Mechanical Behavior, 1997.

#### **Centers**

Admissions Committee Member for MSE, 1997-present.  
Mechanical Behavior Theme Co-Champion for NSF-PIC, 1991-1997.  
Director of Microelectronic Packaging Materials Lab for MRC, 1996-2007.  
Director of Center for Polymer Science and Engineering, 2001-present.  
Research Committee Member, Center for Optical Technologies, 2001-2007.