

## **Brian J. Love, Ph.D.**

Dept of Materials Science and Engineering  
Univ of Michigan  
2644 Bob and Betty Beyster Bldg  
2300 Hayward, Ann Arbor, MI 48109  
734-763-2013, bjlove@umich.edu

### **EDUCATION**

- B. S. 1984, Chemistry, University of Illinois, Urbana-Champaign IL  
Senior Thesis Advisor: JC Bailar, Jr., deceased
- M. S. 1986, Metallurgical Eng. (Polymers) University of Illinois, Urbana-Champaign IL  
MS Thesis Advisor: RP Wool, currently at University of Delaware
- Ph.D. 1990, Applied Science (Materials Science), Southern Methodist University, Dallas, TX.  
Ph.D. Dissertation Advisor: PF Packman, retired

### **APPOINTMENTS**

#### **University of Michigan, Depts of Materials Science, Biomedical Engineering, and Biologic and Materials Science (Dentistry), Ann Arbor, MI 48104**

- Professor, 1/2008 to present

#### **Virginia Tech, Department of Materials Science and Engineering, Blacksburg, VA**

- Assistant Professor 8/93-8/99
- Associate Professor 8/99-8/04
- Professor 8/04-12/07  
Chemical Engineering, Virginia Tech, 2004-present  
VT-WFU School of Biomedical Engineering and Sciences: 2002-present

#### **Georgia Tech, Department of Materials Science & Engineering, Atlanta, GA**

- NIH Postdoctoral Training Fellow 1/91-8/93  
Research focused on the structure and properties of cements and adhesives used in dentistry.

#### **Texas Instruments, Defense Systems & Electronics Grp (now Ratheon) Dallas, TX**

- Process Engineer 8/86-12/90  
Performed manufacturing based research dealing with adhesion issues in fabrication and assembly of printed circuits. Was one of two principal researchers associated with adhesion issues within Texas Instruments.

### **HONORS AND AWARDS**

- National Institutes for Health Training Fellowship, 1991-1993
- Visiting Professorship, Université Claude Bernard, LYON France, 1996, 1999
- Academic Deans List for Teaching: 1994, 1998, 2002, 2004
- Nominee - Virginia Tech Wine Award for Teaching: 2007

**PROFESSIONAL PHILOSOPHY AND DESCRIPTIVE:**

Dr. Love's main areas of research relate to structure/property relationships in synthetic polymers and proteins, the dynamics of structure and rheology in photopolymerizable resins undergoing conversion, and characteristics of dispersion and stability in polymeric solutions and mixtures that are inferred by sedimentation velocity measurements and light scattering. The experimental focus is balanced by a modeling effort to identify kinetic time constants associated with ordering and structural evolution in an attempt to correlate the rapidity of structural changes to the type of molecular structures involved. Much of the work has a biological focus, targeted at observing biophysical intermolecular interactions, creating cellular immobilization for tissue engineering, and understanding cell and protein interactions with surfaces. Areas relevant to bioengineering relate to **orthopaedics, dentistry, neuroscience, and interventional cardiology**.

Current research efforts have expanded to look at homotypic and enzyme driven interactions between protein coated particles, assessing the driving force and kinetics of interaction and determining inhibition strategies. Dr. Love and his group have recently characterized the relative stickiness of albumins derived from different animal species and have observable differences in blocking efficiency. He has published 70+ refereed publications, five book chapters with 2 additional papers in review. Dr. Love also serves on the editorial boards of the *Journal of Adhesion* focused on bioadhesion based research.

At Virginia Tech, Dr. Love has regularly taught classes relating to general materials science, transport phenomena, biomaterials, and materials process selection. He has also taught new graduate courses entitled Skin: Properties, Function and Bioengineering Applications and Cell Adhesion, which have been taught both individually and with faculty in Chemical Engineering. Many of these courses are integrative capstone-like courses that leverage off of prior knowledge and coursework. Dr. Love is adjunct in Virginia Tech's Department of Chemical Engineering and a core member of the Virginia Tech/Wake Forest School for Biomedical Engineering and Sciences. He most recently served as Graduate Coordinator for that program. Dr. Love has been noted for his teaching based on student reviews over several terms, and was nominated in 2007 for the University level Wine Award for Teaching at Virginia Tech.

Dr. Love has been at Michigan since 2008, following 15 years on the faculty in Blacksburg. In addition to his appointments in MSE, BME and Biologic and Materials Science (Dentistry) he is also adjunct at both Wake Forest Univ and Georgetown Univ. Prof Love has also been an instructor in Biomaterials for staff associated with the US Food and Drug Administration's Professional Graduate Certificate Programs.

Dr. Love has increasingly served as a panel reviewer for several grant programs associated with both the National Institutes for Health's Center for Scientific Review and National Science Foundation. He has occasionally performed as a consultant both in terms of review of proposals and industrial consulting. He has participated in 4 law cases, one relating to patent infringement that is currently ongoing and 3 that were related to tort liability.

## Relating to work with electronic packaging materials

1. BJ Love and PF Packman, "Effects of Surface Modification on the Peel Strength of Copper Based Polymer-Metal Interfaces with Characteristic Morphologies", *J Adhesion*, **40**, 139-149 (1993).
2. BJ Love and PF Packman, "The Contributions of Morphological and Surface Chemical Modifications to the Elevated Temperature Aging of Copper-Epoxy Interfaces", *J Materials Science*, **33**, 1359-1367 (1998).
3. BJ Love, J Baborowski, M Charbonnier, and M Romand, "Surface Chemical Characterization of Copper Oxide and Its Relationship to Adhesion in Formed Epoxy/Copper Interfaces", *J Adhesion*, **69**, 165-179 (1999).
4. ML Jackson\*, BJ Love & SR Hebner<sup>&</sup>, "Effects of Environmental Exposure on Solvent- and Water-Based Epoxy Systems", *J Materials Science, Materials in Electronics*, **10**, 71-79 (1999).
5. MK Jensen\*, BJ Love, JW Grant, J Cotton, JR Keiser, and DF Wilson, "Comparison Study of Dicyandiamide-Cured Epoxy Bonded Steel Joints and Polyamidoamine-Cured Epoxy Bonded Steel Joints", *Int J Adhesion Adhesives*, **20**, 437-444 (2000).
6. J Cotton, JW Grant, MK Jensen\*, and BJ Love, "Analytical Solutions to the Shear Strength of Interfaces Failing Under Flexure Conditions", *Int J Adhesion Adhesives*, **21**, 65-70 (2001).
7. ML Jackson\*, and BJ Love, Analysis of Dicyandamide Precipitation in Epoxy Solutions and Latex Dispersions Using a Two-Stage Drying Model, *Polymer.*, **45(21)**, 7229-7238 (2004)
8. BJ Love, F Teyssandier, YY Sun, and CP Wong, Sigmoidal chemorheological models for chip underfill materials offer alternative predictions of cure and flow, *Macromolecular Materials and Engineering*, **293**, 832-835 (2008)
9. F Teyssandier, YY Sun, CP Wong, and BJ Love, Cure vs flow in chip underfill, *Macromolecular Materials and Engineering*, **293**, 828-831 (2008)
10. F Teyssandier, M Ivankovic and BJ Love, Modeling the effect of cure conversion on dynamic viscosity of epoxy resin cured by an anhydride curing agent, *J Applied Polymer Science*, **115**:1671-1674 (2010)
11. A. Yousefi and BJ Love, Probing the temperature sensitivity of induction time in latent cure epoxy resins, *Polymer International*, DOI: 10.1002/pi.4439

## Relating to work in medical materials science

1. BJ Love, KE Starling, Jr. & TV Baughn, "Controlling Adhesion of Orthodontic Adhesives Through Adjustment of the Interphase Mechanical Properties", *J Adhesion*, **45**, 149-159 (1994).
2. RS Pilcher, BJ Love and WC Hutton, JR, "The Effects of Sterilization on the Properties of UHMWPE", *Southern Orthopaedic J* **3(1)**, 27-33 (1994).
3. PF Williams, GL Powell, BJ Love, K Ishihara, N Nakabayashi, R Johnson & M Laberge, "Fabrication and Characterization of Dipalmitoylphosphatidylcholine Attracting Material for Joint Replacement", *Biomaterials*, **16**, 1169-1174 (1995).
4. TG Wilson, BJ Love & CH Smith, "Clinical Effectiveness of Fluoride Releasing Elastomers II, Enamel Microhardness Levels", *American J Orthodontics and Dentofacial Orthopaedics*, **107(4)**, 379-381 (1995).
5. VM Vaubert\*, PC Moon & BJ Love, "Extractable Free Monomers from Self-Cured Dental Sealants", *J Biomedical Materials Research*, **48**, 5-8 (1999).

6. SR Trenor\*, KM Renshaw<sup>&</sup>, M Marek<sup>&</sup>, KE Forsten and BJ Love, "Influence of Surface Chemistry on Particle-Particle Aggregation as Measured by a Coulter Counter in the Low Concentration Regime", *J Adhesion Science and Technology*, **15(10)**, 1189-1198 (2001).
7. PI Dolez, M Marek<sup>&</sup> and BJ Love, "Photopolymerizable Acrylic Resin: Effect of Curing Time and Temperature", *J Applied Polymer Science*, **82**, 546-554 (2001).
8. SR Trenor\*, AE Suggs\*, and BJ Love, "An Examination of Transdermal Drug Delivery Using a Model Polyisobutylene Pressure Sensitive Adhesive", *J Materials Science Letters*, **21**, 1321-1323 (2002).
9. PI Dolez, C Williams<sup>&</sup>, A Goff<sup>&</sup> and BJ Love, "Properties of Photopolymerizable Acrylic Adhesives for Underwater Bonding", *J Society for Underwater Technology*, **25 (4)**, 199-208 (2003).
10. SR Trenor\*, AR Schultz, BJ Love and TE Long, "Coumarins in Polymers: From Light Harvesting to Photoreversible Tissue Engineering Scaffolds", *Chemical Reviews*, **104**, 3059-3077 (2004).
11. AE Suggs<sup>&</sup> PI Dolez, and BJ Love, "The Adaptation of Acrylic Photopolymerized Resins as Model Bone Cements in Total Hip Arthroplasties", *J Adhesion Science and Technology*, **18(10)**, 1091-1102, (2004).
12. B Whited\*, AS Goldstein, D Skrtic, and BJ Love, "Osteoblast Response to Zirconia-Hybridized Pyrophosphate Stabilized Amorphous Calcium Phosphate", *J Biomedical Materials Research* **76(A)** 596-604 (2006).
13. BM Whited\*, AS Goldstein, D Skrtic, and BJ Love, "Fabrication and Characterization of Poly(DL lactic-co-glycolic acid)/Zirconia-Hybridized Amorphous Calcium Phosphate Composites", *J Biomaterials Science, Polymer Edition* **17(4)** 403-418 (2006).
14. EF Burguera and BJ Love, "Reduced Transglutaminase-Catalyzed Protein Aggregation is Observed in the Presence of Creatine using Sedimentation Velocity", *Analytical Biochemistry*, **350** 113-119 (2006).
15. TR Cassino, R Anderson, BJ Love, WR Huckle, D Semons, and K Forsten-Williams, Design and application of an oscillatory compression device for cell constructs, *Biotechnology and Bioengineering*, **98(1)**, 211-220 (2007).
16. JR Popp, BJ Love, and AS Goldstein, Effect of soluble zinc on differentiation of osteoprogenitor cells, *J Biomedical Materials Research*, **81A(3)** 766-769(2007).
17. JR Popp, BJ Love, and AS Goldstein, Calcium phosphate composite scaffoldings for bone tissue engineering, *Tissue Engineering*, **14(5)**, 829-830 (2008).
18. K McKeon and BJ Love, The presence of adsorbed protein on particles increases aggregation as measured by a light scattering technique, *J Adhesion*, **84**, 664-674 (2008).
19. T Savart, C Dove<sup>&</sup> and BJ Love, *In situ* dynamic rheological determinations of polyacrylamide during gelation coupled with mathematical models of viscosity advancement, *Macromolecular Materials and Engineering*, **295**, 145-152 (2010)
20. M Green<sup>&</sup>, et al, "Optical Imaging of Deformation of Living Cells by Pulses of Air Pressure: Strain Measurements in Deformable Microtiter Plates," *Rev. of Scientific Instruments*, **81**:#125102, (2010).
21. JR Popp\*, KE Laffin, BJ Love and AS Goldstein, In Vitro evaluation of osteoblastic differentiation on poly(lactic-co-glycolic acid)/amorphous calcium phosphate composite scaffoldings, *Tissue Engineering and Regenerative Medicine*, **5(10)**, 780-789 (2011).
22. F Teyssandier, and BJ Love, MMA Polymerization and its influence on in situ resin viscosity using other mathematical models of chemorheology, *Journal of Applied Polymer Science* **120**, 1367-1371 (2011).
23. S Prado<sup>&</sup>, JM Weaver<sup>&</sup> and BJ Love, Gelation of photopolymerized hyaluronic acid grafted with glycidyl methacrylate, *Materials Science and Engineering C*, **31(8)**, 1767-1771 (2011).
24. KA Juggernaut\*, AE Gros<sup>&</sup>, NAK Mezmarich\* and BJ Love, In situ photogelation kinetics of nanoparticle-based colloids and the influence of dispersion formulations on gel formation, *Soft Matter*, 2011:DOI 10;1039/c1sm06025b.

25. JR Popp\*, KE Laffin, BJ Love and AS Goldstein, In Vitro Evaluation of poly(Lactic-co-Glycolic Acid)-Calcium Phosphate Composite Scaffolds, *Tissue Engineering and Regenerative Medicine*, 6(1), 12-20 (2011).

## 12. Professional Activities

### Memberships

- American Chemical Society, member since 1985
- The Adhesion Society
  - Newsletter 1994-1999
  - Member at Large 1999-2001
  - Executive Committee Member, 1994-present
  - Vice Chair, Particle Adhesion Division 2001-2004
  - Chair, Particle Adhesion Division 2004-2006
- Society for Biomaterials, member since 1994
- ASTM, International
  - F-24 Sub-Committee on Tissue Adhesives and Tissue Adhesion, member since 2000
- Southern Biomedical Engineering Conference; Executive Board: 1998-2003
- Co-chair for 2<sup>nd</sup> Conference on the Development of Technology in Medicine in Virginia, Charlottesville, VA, November 1999. Co-Chair with JS Lee (UVa) and G Wnek (VCU)

### Editorial Review Boards

- Journal of Adhesion Science and Technology, 2002-2012
- Journal of Adhesion, 2003 to present

### UNIVERSITY SERVICE

#### Univ of Michigan

- SACUA Advisory committee on development 2009-2012
- SACUA Advisory committee on financial affairs, 2012-present
- NEXT Prof Review committee, 2013

#### School of Biomedical Engineering:

- Health Engineering subcommittee
- Undergraduate curriculum committee member for BME

#### MSE Department:

- Faculty Search committee 2008-2012
- Undergraduate coordinator, 2008-2011
- MSE Undergraduate committee, 2008-present
- Katsuyo Thornton Casebook committee 2012

### TEACHING AND ADVISING

Courses listed under normal teaching load:

MSE/BME/MACRO 410 Biomaterials, offered Fall 2013 (79)

MSE 490: Skin: Properties Function and Bioengineering Applications, offered Winter 2013 (5)

MSE 220: Introduction to Materials and Manufacturing (180)

Other courses as part of my repertoire

- Transport Phenomena
- Polymer Deformation and Fracture\*
- Materials Selection and Design II: Process Design

#### Additional courses developed or taught:

- Skin: Function, Physiology & Bioengineering Applications\*.#
- Survey of Biomedical Engineering
- Cell Adhesion\*.#

**Patents (3 issued, 8 other disclosures submitted)**

1. RJ Gordon, BJ Love, B Ozmat, and R Anderson, US Patent # 4,943,468, Ceramic Based Substrate for Electronic Circuit System Modules, issued July 24, 1990.
2. BJ Love, KE Starling, Jr, Orthodontic Adhesive, US Patent # 6,090,867, issued July 18, 2000.
3. BF Courson, JL Wood and BJ Love, Chemiluminescent photo-curable adhesive curing and bonding system, US Patent # 6,235,148, issued May 22, 2001.
4. BJ Love, SR Trenor\* and TE Long, Photomodulated Lubricants Based on Structural Changes in Pre-polymer Chain Length, submitted to Virginia Tech Intellectual Properties, VTIP Disclosure # 03-069, April 2003
5. BJ Love, PI Dolez, C Holton, T Kuhr\*, and R Anderson\*, Purple Light Sensitive Photopolmerizable Acrylate and Methacrylate Based Coatings and Adhesives, VTIP Disclosure # 03-082, May 2003.
6. C Holton, K Meissner, E Herz<sup>&</sup>, BJ Love, Novel Quantum Nano-material Entrained Resins, VTIP Disclosure # 03-085, submitted 7/2003
7. BJ Love and NG Love, Cure on Command Cements for Embolization Surgery, VTIP Disclosure #03-090, July 2003.
8. NG Love, KA Meehan, BJ Love, and D Fleming, Modular Biosensors Based on Immobilized Biological Elements, submitted, July 2004.
9. BJ Love, Formulated polyprophrin IX incorporated into micelle gels submitted to the UM Office of Tech Transfer, # 2012-5463, 8/2012
10. BJ Love, Fixation Scheme For Straw-Punctured Drink Boxes, submitted to UM Office of Tech Transfer, # 2012- 5458, 7/24/2012
11. BJ Love and AE Armstrong, Embolic Fluid Therapy for filling septal defects, submitted to UM Office of Tech Transfer # 2013- 6015, submitted, 11/4/2013...part of a larger group of related disclosures in process.