Allison Hess Dunning

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Education

Case Western Reserve University — Cleveland, Ohio
Ph.D. in Electrical Engineering — May 2011
Dissertation: "Integration of Process-Incompatible Materials for Microfabricated, Polymer-based Neural Interfaces"
Thesis Advisor: Christian A. Zorman, Ph.D.

Case Western Reserve University — Cleveland, Ohio
M.S. in Electrical Engineering — May 2008
M.S. Thesis: "Design and Fabrication of Polynorbornene- and Liquid Crystal Polymer-Based Electrode Arrays for Biomedical Applications"

University of Pittsburgh — Pittsburgh, Pennsylvania
B.S. in Engineering Physics, minor in Electrical Engineering — May 2005
Summa cum laude

Experience

Biomedical Engineer — June 2011-present
Louis Stokes Cleveland Department of Veterans Affairs Medical Center

Research Assistant — Aug. 2005-May 2011
Case Western Reserve University — *Cleveland, Ohio*

Teaching Assistant
Case Western Reserve University — *Cleveland, Ohio*

Electrical Engineering Intern — April-Aug. 2003, May-Aug. 2004
ZIN Technologies — *Brook Park, Ohio*

Honors and Awards

2015	Career Development Award – Level 2 – Rehabilitation R&D, Department of Veterans Affairs
2013	Career Development Award – Level 1 – Rehabilitation R&D, Department of Veterans Affairs
2012	Postdoctoral Diversity Travel Award – Neural Interface Conference 2012
2010	Materials Research Society Fall 2010 Meeting – Best Poster Award
2008	AVS 55th International Symposium & Exhibition, BioMEMS Topical Conference - Young Investigator Award (1 of 2 awards given, only graduate student recipient)
2007	IEEE Conference on Neural Engineering Travel Award
2005	Case Prime Fellowship
2002	Fessenden-Trott Scholarship Recipient, University of Pittsburgh
2001	University Scholarship Recipient, University of Pittsburgh

Memberships:
Materials Research Society (MRS)
Institute of Electronics and Electrical Engineers (IEEE)
American Vacuum Society (AVS)
American Association for the Advancement of Science (AAAS)

Grant Support

8/2015-7/2019: CDA-2 “Flexible Multi-Sensory Mode Neural Devices for Neurochemical Control“

7/2013-6/2015: CDA-1 “Nanobiosensing Neural Probes for Traumatic Brain Injury Applications”

FY2012: RIP “Mechanically-Flexible Micro-Optrode Platform for Optical Neural Stimulation Applications”

Peer-reviewed Journal Publications

[9] **A. Hess-Dunning,** R.L. Smith, C.A. Zorman, “Development of polynorbornene as a structural material for microfluidics and flexible BioMEMS,” *Journal of Applied Polymers Science,* vol. 131, 40969 (2014).

[8] J.K. Nguyen, D.J. Park, J.L. Skousen, **A.E. Hess-Dunning**, D.J. Tyler, S.J. Rowan, C. Weder, J.R. Capadona, “Mechanically-Compliant Intracortical Implants Reduce the Neuroinflammatory Response”, *Journal of Neural Engineering,* vol. 11, 056015 (2014).

[7] **A. Hess-Dunning**, D. Tyler, J. Capadona, C. Weder, S. Rowan, C. Zorman, “Microscale Characterization of a Mechanically Adaptive Polymer Nanocomposite With Cotton-Derived Cellulose Nanocrystals for Implantable BioMEMS,” *Journal of Microelectromechanical Systems,* vol. 23, pp. 774-784 (2014).

[6] **A.E. Hes**s, K. Potter, D.J. Tyler, C.A. Zorman, J.R. Capadona, “Environmentally-controlled Microtensile Testing of Mechanically-Adaptive Polymer Nanocomposites for Ex Vivo Characterization,” *Journal of Visualized Experiments,* e50078 (2013). *[Chosen for a JoVE press release, View Count: 1,284 as of 2/26/2014]*

[5] **A.E. Hess**, D.M. Sabens, H.B. Martin, C.A. Zorman, “Diamond-on-Polymer Microelectrode Arrays Fabricated Using a Chemical Release Transfer Process“, *Journal of Microelectromechanical Systems,* vol. 20, pp. 867-875 (2011).

[4] A. Barnes, **A. Hess**, C. Zorman, M. Diewvilai, “Development of a Packaging System for Clinical Evaluation of a Nanocomposite-Based Neural Electrode Array Fabricated from a Chemoresponsive Polymer Substrate”, *Journal of Surface Mount Technology*, vol. 24, pp. 17-25 (2011).

[3] J.P. Harris, **A.E. Hess***, S.J. Rowan, C. Weder, C.A. Zorman, D.J. Tyler, J.R. Capadona, “*In vivo* deployment of mechanically adaptive nanocomposites for intracortical microelectrodes“, *Journal of Neural Engineering*, vol. 8, pp. 046010, (2011). [*co-first author]

[2] **A.E. Hess**, J.R. Capadona, K. Shanmuganathan, L. Hsu, S.J. Rowan, C. Weder, D.J. Tyler, C.A. Zorman, “Development of a stimuli-responsive polymer nanocomposite toward biologically-optimized, MEMS-based neural probes “, *Journal of Micromechanics and Microengineering*, vol. 21, pp. 054009, (2011).

[1] **A.E. Hess**, D.M. Sabens, H.B. Martin, C.A. Zorman, "Polycrystalline Diamond-on-Polymer Electrode Arrays Fabricated Using a Polymer-Based Transfer Process", *Electrochemical and Solid-State Letters*, vol. 13, pp. J129-J131, (2010).

Refereed Book Chapters

[1] **A. Hess-Dunning** and C.A. Zorman, "Electrical Interfaces for Recording, Stimulation and Sensing", in *Implantable Biomedical Microsystems: Design Principles and Applications, 1st Edition,* Elsevier, Chapter 2 (2015).

Conference Proceedings Papers

[9] M. Jorfi, K.A. Potter, J.K. Nguyen, **A.E. Hess-Dunning**, E.J. Foster, J.R. Capadona, C. Weder, "Mechanically adaptive materials for intracortical implants," in *2015 7th International IEEE/EMBS Conference on Neural Engineering (NER),* Montpelier, 2015, pp. 601-602.

[8] **A.E. Hess-Dunning, D.J. Tyler, C.A. Zorman**, "Stretchable Thin-Film Metal Structures on a Stimuli-Responsive Polymer Nanocomposite for Mechanically-Dynamic Microsystems," in *Technical Digest of The 17th International Conference on Solid State Sensors, Actuators and Microsystems (Transducers 2013),* Barcelona, Spain, June 16-20, 2013.

[7] **A.E. Hess**, K. Shanmuganathan, J.R. Capadona, L. Hsu, S. Rowan, C. Weder, D.J. Tyler, C.A. Zorman, "Mechanical Behavior of Microstructures from a Chemo-responsive Polymer Nanocomposite Based on Cotton Cellulose Nanofibers," in *Technical Digest – 24th International Conference on Microelectromechanical System (MEMS 2011)*, Cancun, Mexico, January 23-27, 2011, pp. 453-456.

[6] **A.E. Hess** and C.A. Zorman, "Fabrication and Characterization of MEMS-Based Structures from a Bio-Inspired, Chemo-responsive Polymer Nanocomposite," *Proceedings - Fall 2010 Meeting of the Materials Research Society*, Boston MA, November 29-December 3, 2010, 1299, pp. 1-6. (also cited as Abstract #S4.7 in the technical program) **Best Poster Award**

[5] **A. Hess**, D. Sabens, H. Martin, C. Zorman, "Polycrystalline Diamond-On-Polymer Microelectrode Arrays For Mechanically-Flexible Neural Interfacing", in *Technical Digest - 2010 Solid State Sensors, Actuators and Microsystems Workshop (Hilton Head 2010)*, Hilton Head SC, June 6-10, 2010, pp. 142-145

[4] **A. Hess**, J. Dunning, J. Harris, J.R. Capadona, K. Shanmuganathan, S.J. Rowan, C. Weder, D.J. Tyler, and C.A. Zorman, "A Bio-Inspired, Chemo-responsive Polymer Nanocomposite for Mechanically Dynamic Microsystems", in *Technical Digest of The 15th International Conference on Solid State Sensors, Actuators and Microsystems (Transducers 2009),* Denver CO, June 21-25, 2009, pp. 224-227.

[3] **A. Hess**, J. Dunning, D. Tyler and C.A. Zorman, "A Polynorbornene-Based Microelectrode Array For Neural Interfacing" *Technical Digest - 14th International Conference on Solid State Sensors, Actuators and Microsystems (Transducers 2007)*, Lyon France, June 9-14, 2007, pp. 1235-1238.

[2] **A. Hess**, J. Dunning, D. Tyler, and C.A. Zorman, "Development of a Microfabricated Flat Interface Nerve Electrode Based on Liquid Crystal Polymer and Polynorbornene Multilayered Structures", *Proceedings - 3rd International IEEE EMBS Conference on Neural Engineering*, Kohala Coast, Hawaii, May 2 – 5, 2007, pp. 32-35.

[1] **A. Hess**, J. Du, R. Parro, J. Dunning and C.A. Zorman, "PECVD Silicon Carbide as a Thin Film Packaging Material for Microfabricated Neural Electrodes", *Proceedings - Spring 2007*

Meeting of the Materials Research Society, San Francisco CA, April 9-12, 2006, Also cited as *Material Research Society Symposium Proceedings,* vol. 1009E, paper # 1009-U04-03.

Abstracts of Conference Presentations

[16] **A. Hess-Dunning,** "Integration of Microfluidic Channels for Hybrid Drug-Delivery Mechanism in Mechanically-Adaptive Neural Probes," presented at 2017 MRS Spring Meeting, Phoenix, AZ, April 19, 2017.

[15] **A. Hess-Dunning**, "Multi-functional Bio-inspired Neural Microsystems Toward Locally-Responsive Brain Interfaces," presented at AVS Ohio Chapter Annual Meeting 2015, Cleveland, OH, October 10, 2015.

[14] C.A. Zorman and A. Hess-Dunning, ""Fabrication of polymer-based neural interfaces from process-incompatible materials," presented at AVS Ohio Chapter Annual Meeting 2015, Cleveland, OH, October 10, 2015.

[13] **A. Hess-Dunning**, C.A.Zorman, D.J. Tyler, "Intracortical Probes for Neural Recording Based on a Stimuli-Responsive Polymer Nanocomposite Substrate with Switchable Stiffness," presented at Neural Interfaces Conference 2012, Salt Lake City, UT, June 18-20, 2012, Abstract #E-27.

[12] N. Brill, **A. Hess**, L. Miller, C. Ethier, D.J. Tyler, "Selective Activation of Upper Extremty Muscles Using High Density Nerve Cuff Electrodes in Nonhuman Primates," presented at Neural Interfaces Conference 2012, Salt Lake City, UT, June 18-20, 2012, Abstract #I-1.

[11] H.B. Martin, D.M. Sabens, **A.E. Hess**, C.A. Zorman, "Diamond-on-polymer Microelectrode Arrays as Flexible Electrochemical Sensors," presented at *Fall 2010 Meeting of the Materials Research Society,* Boston, MA, November 29 - December 3, 2010, Abstract #A8.4.

[10] **A.E. Hess**, K. Shanmuganathan, J. Harris, J.R. Capadona, L. Hsu, S.J. Rowan, C. Weder, D.J. Tyler, C.A. Zorman, "Fabrication of Mechanically-Dynamic, Chemo-Responsive Polymer Nanocomposite Microdevices for Neural Interfacing," presented at *Biomaterials Day*, November 6, 2010, Cleveland, Ohio.

[9] D.M. Sabens, **A.E. Hess**, C.A. Zorman, H.B. Martin, "Electrochemistry on a flexible diamond-on-polymer electrode array," presented at *21st European Conference on Diamond, Diamond-Like Materials, Carbon Nanotubes, and Nitrides*, Budapest, Hungary,

[8] H. Martin, J.M. Halpern, D.M. Sabens, **A.E. Hess**, C.A. Zorman and H.J. Chiel, "Mechanically-flexible Diamond Electrodes for Implantable Neural Devices", presented at the *2010 European MRS Spring Meeting*, Strasbourg, FR, June 7-9, 2010. **Invited Talk**

[7] H.B. Martin, J.M. Halpern, D.M. Sabens, **A.E. Hess**, and C.A. Zorman, "Mechanically-flexible diamond electrodes for implantable sensors" presented at the *2009 Annual Meeting of the American Institute of Chemical Engineering*, Nashville TN, November 8-13, 2009, Abstract # 154b.

[6] D. Sabens, **A.E. Hess**, C.A. Zorman and H.B. Martin, "Mechanically-flexible Electrode Arrays based on Selectively-grown Diamond Thin Film Patterns and Temperature-Sensitive Polymer Substrates", presented at the *20th European Conference on Diamond*, (Diamond 2009), Athens, Greece, October 6-10, 2009. Abstract # O81.

[5] D. Sabens, **A. Hess**, C.A. Zorman and H. Martin, "Mechanically flexible Electrode Arrays based on Selectively Grown Diamond Thin Film Patterns and Temperature Sensitive

Polymer Substrates" presented at the *New Diamond and NanoCarbons Conference 2009*, Traverse City MI, June 7-11, 2009.

[4] J.P. Harris, J.R. Capadona, K. Shanmuganathan, **A. Hess**, J. Dunning, S.J. Rowan, C. Zorman, C. Weder, and D.J. Tyler, "Cortical Tissue Response to a Mechanically-Dynamic Polymer Nanocomposite", presented at the *37th Annual Meeting of the Society for Neuroscience*, November 15-19, 2008, Washington, DC.

[3] J. Capadona, K. Shanmuganathan, J. Harris, **A. Hess**, J. Dunning, C. Zorman, D. Tyler, S. Rowan, and C. Weder, "Bio-inspired Mechanically-dynamic Polymer Nanocomposites for Intercortical Microelectrode Substrates", presented at the *214th Meeting of the Electrochemical Society*, Honolulu HI, October 12-17, 2008.

[2] **A. Hess**, J. Dunning, D, Tyler and C.A. Zorman, "Development of Microfabricated Peripheral Nerve Electrodes Made from Liquid Crystal Polymer and Polynorbornene", presented at the *38th Annual Neural Interfaces Conference*, Cleveland OH, June 16-18, 2008.

[1] **A. Hess**, J. Dunning, D. Tyler and C.A. Zorman, "A Polynorbornene-based Microelectrode Array for Neural Interfacing", presented at Neural *Engineering and Rehabilitation Lectures*, Cleveland, Ohio, June 8, 2007.

Invited Talks and Other Presentations

[12] S. Koppaka, **A.E. Hess**, P. Marasco, D.Tyler, "Force Required to Insert Probes into Epineurial and Perineurial Membranes", Biomedical Engineering Society Conference, Hartford, Connecticut, October 14, 2011, abstract #Fri-2-5-F.

[11] C. Zorman and **A. Hess**, "Development of New Materials and Processes for Mechanically-flexible, Microfabricated Neural Electrode Arrays for Long-Term Implant Applications", presented at the Deparment of Chemical Engineering Seminar, University of Louisville, October 15, 2010, **invited**.

[10] **A. Hess**, D. Sabens, H. Martin, and C.A. Zorman, "Microfabrication of Flexible Diamond Microelectrode Arrays on Polymer Substrates", presented at Research ShowCase 2010, Case Western Reserve University, April 15, 2010.

[9] J. Harris, J. Capadona, **A. Hess**, J. Dunning, K. Shanmuganathan, S. Koppaka, S. Rowan, C. Weder, C. Zorman, and D. Tyler, "Tissue response to mechanically dynamic intracortical microelectrodes", Research Day and 40th Anniversary Celebration, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, Ohio 44106, October 22, 2009.

[8] J.P Harris, J.R. Capadona, K. Shanmauganathan, **A. Hess**, J. Dunning, S.J. Rowan, C.A. Zorman, C. Weder, and D.J. Tyler, "Pliant polymer microprobes for intracortical electrodes", Biomedical Engineering Society (BMES) Annual Meeting, Pittsburgh PA, October 7-10, 2009, Poster # PS 10A-162.

[7] **A. Hess**, J. Dunning, J. Harris, J. Capadona, D. Tyler, and C.A. Zorman, "Fabrication and Evaluation of Mechanically Dynamic Microsystems from a Bio-inspired Polymer Nanocomposite", presented at Research ShowCase 2009, Case Western Reserve University, April 16, 2009.

[6] **A. Hess**, J. Dunning, J. Harris, J.R. Capadona, K. Shanmuganathan, S. Rowan, C. Weder, D. Tyler and C.A. Zorman, "Microfabrication of MEMS-based Neural Probes from a Bio-

inspired, Mechanically Dynamic Polymer Nanocomposite", presented at the AVS 55th International Symposium, Boston MA, October 19-24, 2008.

[5] J. Harris, J.R. Capadona, K. Shanmuganathan, S.J. Rowan, C. Weder, **A. Hess**, J. Dunning, C.A. Zorman, and D.J. Tyler "Cortical Response to Polyvinyl Acetate- Tunicate Whisker Polymer Nanocomposite (PVAc-TW)", presented at Research ShowCase 2008, Case Western Reserve University, Cleveland OH April 16-17, 2008.

[4] **A. Hess**, J. Dunning, D.J. Tyler, K. Polasek, N. Brill, C.A. Zorman "Development of Microfabricated, Mechanically Flexible, Peripheral Nerve Electrode Arrays, presented at Research ShowCase 2008, Case Western Reserve University, Cleveland OH April 16-17, 2008.

[3] **A. Hess**, J. Dunning, D. Tyler and C.A. Zorman, "A Polynorbornene-based Microelectrode Array for Neural Interfacing", Neural Engineering and Rehabilitation Lectures, Cleveland, Ohio, June 8, 2007.

[2] **A. Hess**, J. Dunning, D. Tyler and C.A. Zorman, "Development of FINE Electrode Structures Based on Micromachined Polymer Substrates", Research Showcase 2007, Case Western Reserve University, Cleveland, Ohio, April 11-12, 2007.

[1] V. Keesara, **A. Hess**, and C.A. Zorman, "Process Development and Evaluation of Polynorbornene as a Structural Material in Multilayered Flexible Devices" presented at Research ShowCase 2006, Case Western Reserve University, Cleveland, Ohio, April 5-6, 2006.

Referee for Scientific Journals and Conference Technical Programs

Journal of Micromechanics and Microengineering

IEEE Sensors

International Journal of Mechanical Science

Journal of Physics D

IEEE Journal of Emerging and Selected Topics in Circuts and Systems

International Journal of Nanomedicine

Journal of Applied Polymer Science

IEEE Transactions in Industrial Electronics

IEEE Sensors 2016