

Marek Hempel

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Education	Massachusetts Institute of Technology Cambridge, MA Doctoral Student, Department of Electrical Engineering and Computer Science. Research focuses on the synthesis, large scale transfer and applications of 2D materials such as graphene and MoS ₂
	RWTH Aachen University Aachen, Germany M.Sc. Department of Electrical Engineering and Information Technology, May 2013. Thesis: Gate Dielectrics Optimization in the 28 nm Technology Node for Improved Electrical Properties and Reliability
	RWTH Aachen University Aachen, Germany B.Sc. Department of Electrical Engineering and Information Technology, September 2010. Thesis: Fabrication of nanoscale oxidic and sulfidic membranes for the characterization of hydrogen diffusion behavior
Scholarships, Fellowships	Edwin Webster Fellowship for exemplary academic accomplishments (2013), <i>Bildungsfond Scholarship</i> for excellent course achievements (2011), <i>Bildungsfond Scholarship</i> for excellent course achievements (2010)
Research Experience	MIT Department of Electrical Engineering and Computer Science Cambridge, MA Advisor: Tomas Palacios & Jing Kong <ul style="list-style-type: none">currently working on roll-to-roll setup (R2R) to transfer graphene by lamination onto target substrate and subsequent electrochemical delaminationWork involves the synthesis of graphene, construction and testing of R2R setup, selection of viable flexible and transparent polymers and characterization of resultsWork on doping of graphene to improve conductivity to below 100 Ohms/sq. in order to use it as transparent conductor (Sept. 2013 - present)
	GLOBALFOUNDRIES- Frond End Technology Development Dresden, Germany Advisor: Martin Trentzsch (GLOBALFOUNDRIES), Joachim Knoch (RWTH Aachen) <ul style="list-style-type: none">Project on characterization of interface charge traps in a 28 nm HKMG technology and reduction by fluorine implantation into gate stack

- rebuild and refined charge pumping measurement software (in Agilent VEE) to determine D_{it} and resolve traps laterally under gate and in depth (into gate dielectric)
- designed and evaluated blanket wafer experiment to find best position in processing flow to implant fluorine
- designed and evaluated device wafer experiment with fluorine implantation after different steps (Oct. 2011 – Apr. 2012 & Nov. 2012 – May 2013)

MIT Department of Electrical Engineering and Computer Science

Cambridge, MA

Advisor: Jing Kong

- explored novel class of strain gauge based on graphene flakes spray coated onto flexible (PET) and rigid substrates (glass)
- build deposition system to spray solutions uniformly on XY-movable, computer controlled hot plate
- build computer controlled straining device to consistently measure fabricated devices
- fabricated strain gauges with gauge factor of up to 150 (May 2011 – Oct. 2011)

RWTH Aachen University, Institute of Electronic Materials II

Aachen, Germany

Advisor: Prof. Rainer Waser, Stefan Tappertzhofen (supervising Ph.D student)

- Fabrication and characterization cells for resistive switching
- Manufacture and design improvement of a device structure for the diffusion analysis of hydrogen in thin films
- Device consists of 400 nm thick oxide membranes with mesh electrodes on both sides
- Fabrication was accomplished using wet etching and RIE, e-beam dep. of metals and sputtering of oxide layer (Nov. 2010 – Mar. 2011)

RWTH Aachen University, Institute of Electromagnetic Energy Conversion Aachen, Germany

Advisor: Prof. Kay Hameyer, Richard Rothe (supervising Ph.D student)

- Simulation of the jet path during electro-spinning
- Market analysis of commercially available electrical vehicles (May 2008 – Mar. 2010)

Teaching Experience

MIT Department of Electrical Engineering and Computer Science

Cambridge, MA

6.012 Microelectronics Devices and Circuits, Teaching Assistant

- Created problem sets and quizzes
- Prepared and gave weekly tutorials and review sessions
- Presented problem solutions in class (Sept 2015 – Dec 2015)

Experience

Basic Principles of Electronic Materials and Components II, Teaching Assistant together with Ph.D student

- Revised material from lecture relevant for practice problems
- Helping students with comprehension questions in class
- Presented problem solutions in class

(May 2010 – Jul 2010)

Publications

“Enhancing the Sensitivity of Percolative Graphene Films for Flexible and Transparent Pressure Sensor Arrays” Chen, Z., Ming, T., Goulamaly, M. M., Yao, H., Nezich, D., Hempel, M., Hofmann, M. and Kong, . (2016),. Adv. Funct. Mater.. doi:10.1002/adfm.201503674

“Nanoscale Tunable Strong Carrier Density Modulation of 2D Materials for Metamaterials and Other Tunable Optoelectronics”, Cheng Peng, Dmitri Efetov, Ren-Jye Shiue, Sebastien Nanot, Marek Hempel, Jing Kong, Frank Kop-Pens, Dirk Englund, APS Mar Meeting 2016

“Improvement of minority-carrier lifetime in tin monosulfide via substrate engineering” Rupak Chakraborty, Vera Steinmann, Marek Hempel, Paul Rekemeyer, Benjamin K. Ofori-Okai, Katy Hartman, Amanda Youssef, Austin Akey, Keith A. Nelson, Silvija Gradečak, Jing Kong, Tonio Buonassisi, 2016 PVSC

“Fluorine Interface Treatments within the Gate Stack for Defect Passivation in 28nm HKMG Technology”, M. Drescher, E. Erben, M. Trentzsch, C. Grass M. Hempel, A. Naumann, J. Sundqvist, J. Schubert, J. Szillinski, A. Schäfer, and Mantl, IEEE SISC 2013

“A Novel Class of Strain Gauges Based on Layered Percolative Films of 2D Materials.” M. Hempel, D. Nezich, J. Kong, and M. Hofmann, ACS Nano Letters 2012 12 (11), 5714-5718

“Proton Mobility in SiO₂ Thin Films and Impact of Hydrogen and Humidity on the Resistive Switching Effect.” S. Tappertzhofen, M. Hempel, I. Valov, and R. Waser, MRS Proceedings 2011, Vol. 1330

Extracurricular

Activities

Active Member of student group EECS REFS EECS (Resource for easing Stress and Friction), helping students deal with small issues in their personal and academic environments, completed a 40h class in conflict management as qualification (May 2015 – present)

Co-Chair, MTL Annual Research Conference 2015, in charge of organizing student run conference for about 250 students, postdocs, faculty and industry members. (Apr. 2014 – Jan. 2015)

VP of Student life, EECS Graduate Student Organization, organizing social events for EECS grad community e.g. movie nights, games nights, etc. (Jan 2015 to Jan 2016).

Active Member, VDE (Association for Electrical, Electronic and Information Technologies) student group at RWTH Aachen (2008 – 2013), helped organize seminars, trips to companies and national conferences. Hall Councilor, WEH Dormitory RWTH Aachen (2008 – 2012)

References

References available upon request