

Brian Beatty

Curriculum Vitæ

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✉ Brian.R.Beatty@Drexel.edu

Education

- 2011-Present **M.S. Studies in Materials Science (Dual Degree)**, *Politecnico di Milano*, Milan, Italy.
Selected as one of Drexel University's first participants in the newly formed EAGLES International Exchange Program sponsored by the EU Commission and the US Department of Education and Cultural Affairs
- 2007-Present **B.S./M.S. Studies in Materials Science (Major)**, *Drexel University*, Philadelphia, PA.
Qualified to Graduate with Honors
Cumulative GPA: 3.56
Junior/Senior GPA: 3.92
Selected as one of 15 STAR (Students Tackling Advanced Research) Scholars
Awarded A.J. Drexel Dean's Scholarship and William F. Mitchell SuperNOVA Scholarship

Master's thesis

- Title *Atomic Layer Deposition of Perovskite Oxide Thin Films*
- Supervisors Dr. Jonathan E. Spanier — *Drexel University, Philadelphia, PA, USA*
Dr. Carlo S. Casari — *Politecnico di Milano, Milano, Italia*
- Description Atomic Layer Deposition (ALD) has been shown to be capable of depositing ultra-thin films (<100 nm) of perovskite oxides. These are technologically valuable due to their wide range of properties, ranging from ferroelectricity and ferromagnetism to superconductivity. With the use of ALD, it becomes possible to deposit thin and conformal coatings of these materials to three-dimensional surfaces with the ability to carefully control thickness with sub-nanometer resolution. Research work focuses on the lead titanate (PbTiO_3) end group of the lead zirconate titanate ($\text{PbTi}_x\text{Zr}_{1-x}\text{O}_3$) system.

Experience

- Summer 2012 **Thesis Research**, *Universidad Politécnica de Madrid*, Madrid, Spain.
Completed remaining experiments and data analysis for M.S. thesis. Authored final M.S. thesis document.
Defended the project in collaboration with research groups from Spain, Italy, and the USA.
- 2009–2011 **Research Experience**, *MesoMaterials Laboratory (MML)*, Drexel University.
Focused research on application of Atomic Layer Deposition to ferroelectric oxide thin films.
 - Co-Op Experiences were 6 month periods (Spring/Summer) of full time employment at MML.
 - Student Research was performed during periods when simultaneously attending courses.
 - 2011
 - Collaborated in development of ellipsometry analysis procedure for thin films
 - Designed new sub-system for ALD reactor, improving capabilities and minimizing precursor consumption
 - Lead international group in ALD oxide deposition, focused on both PbTiO_3 and BiFeO_3 systems
 - 2010
 - Applied statistics-based design of experiments to solve a problem with interfering variables
 - Model- and simulation-driven process optimization to select precursors for improving yields
 - Determination of alternative reaction materials
 - 2009
 - Assumed leadership of PbTiO_3 project
 - Assigned to management and upkeep of ALD reactor
- Fall, 2011 **Abstract Accepted to MRS Fall Session.**
On results of oriented lead titanate thin film deposition via ALD onto single crystalline surfaces.
- Summer 2008 **STAR: Summer Research Experience**, *MesoMaterials Laboratory*, Drexel University.
Conceptualized and organized a personal research project that developed into a long term research and M.S. Thesis funded by the ARO.
 - Data analysis (using Matlab and Igor software packages)
 - Training and over 150 hours of experience on various characterization tools
- 2007–2008 **Training in Atomic Layer Deposition**, *MesoMaterials Laboratory*, Drexel University.
Worked under graduate mentor Rahul Joseph researching application of advanced thin film deposition methods. Trained on operation and maintenance of ALD reactor

Publications

- April, 2012 **Shape-Controlled Vapor-Transport Growth of Tellurium Nanowires**, Christopher J. Hawley, Brian R. Beatty, Guannan Chen, and Jonathan E. Spanier, *Crystal Growth & Design* **2012** 12 (6), 2789–2793.
- March, 2012 **The Ferroelectric Field Effect within an Integrated Core/Shell Nanowire**, Stephen S. Nonnenmann, Mohammad A. Islam, Brian R. Beatty, Eric M. Gallo, Terrence McGuckin, and Jonathan E. Spanier, *Adv. Funct. Mater.* **2012**.

Equipment Experience

- Thin Film Deposition** Atomic Layer Deposition (ALD), Chemical Vapor Deposition (CVD), Pulsed Laser Deposition (PLD), Molecular Beam Epitaxy (MBE), Sol-Gel Deposition, Thermal Evaporation, E-Beam Evaporation, R.F. Sputtering.
- Film Analysis Methods** X-Ray Diffractometry (XRD), X-Ray Reflectivity (XRR), Scanning Electron Microscopy (SEM), Energy-Dispersive X-Ray Spectroscopy (EDXS), X-Ray Fluorescence Spectroscopy (XRF), Ellipsometry, Rutherford Backscattering Spectroscopy, Photoluminescence.
- Chemical Analysis** Fourier-Transform Infrared Spectroscopy (FTIR), Differential Scanning Calorimetry (DSC), Thermo-gravimetric Analysis (TGA), Gas-Chromatography/Mass-Spectroscopy (GC-MS).
- Electrical Characterization** Hall Effect measurements, Cyclicvoltammetry (CV), Piezoelectric/Ferroelectric measurements, Piezoelectric force microscopy (PFM).

Computer skills

- Languages MATLAB, Maple, \LaTeX , Igor
- Tools Origin, Igor, LabView, FilmWizard, Microsoft Office Suite, Adobe Suite
- Platforms Mac OS, Windows

Spoken Languages

- English **Native Speaker**
- Spanish **Speaking:** Moderate
Reading: Moderate
Writing: Moderate
- Italian **Speaking:** Elementary
Reading: Elementary
Writing: Elementary

Personal Interests

- Electronics Design and synthesis of novel materials for IC applications, particularly those leveraging unique nanoscale properties
- Energy Nanoscale structures for high-efficiency photovoltaic devices.
- Culinary Arts Personal hobby.