

CURRICULUM VITAE

Dr. Mahmut Aksit

Asst. Prof.
Gebze Technical University
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EDUCATION:

Ph.D.: Cornell University Department of Materials Sci. and Eng., Ithaca, NY, (2008-2014)

- Thesis: “Inorganic Thin Films And Nanosheets: Fabrication, Characterization And Simulation”
Advisor: Assoc. Prof. Richard D. Robinson
- CGPA:3.84/4.00

M.S.: Cornell University Department of Materials Sci. and Eng., Ithaca, NY, (2012)

- M.S. awarded as part of the combined Ph.D. program.
- CGPA: 3.78/4.00

Undergraduate: Sabanci University, Istanbul, Turkey, (2003-2008):

- Materials Science and Engineering with minor in Physics
- Thesis: “Production of novel terahertz frequency devices with YIG: Spin wave approach to terahertz tomography”
Advisor(s): Prof. Mehmet Ali Gulgun and Assoc. Prof. Cleva W. Ow-Yang
- CGPA:3.56/4.00 (Ranked first among students with Physics Minor)

High School: Denizli Erbakir Fen Lisesi, Denizli, Turkey, (2000-2003):

- CGPA: 5.00/5.00

WORK EXPERIENCE:

3M Company, Central Materials Research Laboratory, Inorganics and Ceramic Cluster

- *Acoustically active nano-metal oxides (03/2016 to Present)*:*
Developing novel acoustically active nano-oxides to shift resonance frequencies of acoustic cavities for stronger bass sound in small size speakers.
- *Encapsulated Particles: Develop metal oxide encapsulated particles for chemical, electrical, and optical applications (06/2015 to Present):*
 - *Developing novel dental materials with improved cell viability and remineralization capabilities by APCVD coating of specific component(s) of dental materials *.*
 - *Improving retroreflective brightness of 3M retroreflective beads by applying anti-reflective coatings. Project involves: 1) Single and multilayer APCVD coating of retroreflective beads with amorphous metal oxides of Si-O and Ti-O, 2) performing retroreflectance measurements.*
 - *Developing novel electromagnetic interference (EMI) materials with improved absorption by APCVD coating of EMI materials *.*
- *Metal Oxide Thermoelectrics (06/2015 to Present)*:*
Producing nanostructured metal oxide thermoelectric materials for a specific application.

- *Composites of 2D Metal Oxides with Non-Linear Resistance for High Voltage Insulation (06/2014 to Present)*:*

Developing novel metal oxide nano-platelet composites with non-linear electrical resistance. In addition to materials synthesis and structural characterization the project also involves preparing/operating computer aided experimental setup for performing current/voltage measurements up to 10 kV.

- *Quantum Dot Encapsulation (06/2014 to 12/2015):*

Encapsulation of quantum dot containing composite particles with hermetic metal oxide coatings using APCVD for improved chemical durability, Project involved: 1) APCVD coating of quantum dot composite particles with amorphous Al-O, 2) glove-box preparation of quantum dot enhancement films (QDEF) from the resulting composite powder, 3) performing QDE measurements and chemical durability tests on QDEF

**Cornell University Materials Science and Engineering Department-Robinson Research Group
(Supervisor: Assoc. Prof. Richard D. Robinson)**

- *Synthesis and Characterization of Novel p-type Transparent Conducting Oxides of Layered Alkali Cobaltates (09/2009 to 05/2014):*

Discovered novel, high figure of merit p-type transparent conducting metal oxides/thin films using a low cost solution process. Project involved: 1) Sol-gel assisted, solution based synthesis of nano-structured thin films of $\text{Ca}_3\text{Co}_4\text{O}_9$, Na_xCoO_2 and $\text{K}_x\text{CoO}_2 \cdot y\text{H}_2\text{O}$, 2) performing 4 point resistivity, sheet resistance, Seebeck coefficient and charge carrier mobility measurements, 3) performing specular optical transmission measurements.

- *Synthesis and Characterization of mm Long Metal Oxide Nanosheets with unprecedentedly high anisotropy (09/2009 to 08/2013):*

Discovered novel method for scalable manufacturing of mm long metal oxide nanosheets with unprecedentedly high anisotropy. The method also involves discovery of low temperature e-field induced kinetic demixing as a novel method of nanoscale ceramic processing. Project involved: 1) Synthesis of Nanosheets of Na_xCoO_2 , $\text{Li}_x\text{Na}_y\text{CoO}_2$, K_xCoO_2 and $\text{K}_x\text{CoO}_2 \cdot y\text{H}_2\text{O}$ via a multiple step low cost synthesis procedure which involves sol-gel chemistry, e-field induced kinetic demixing and high temperature treatment 2) Thermoelectric Characterization of Na_xCoO_2 and $\text{K}_x\text{CoO}_2 \cdot y\text{H}_2\text{O}$ nanosheets (S , K and ρ) 3) Cyclic Voltammetry and Charge-Discharge studies of $\text{Li}_x\text{Na}_y\text{CoO}_2$ 4) GID (Grazing Incidence Diffraction) X-ray characterization of nanosheets at Cornell High Energy Synchrotron Source.

- *Superconducting Tunnel Junction (STJ) Based Phonon Spectrometry through Si Nanosheets (09/2008 to 05/2014):*

Developed a micro-scale phonon spectrometer to understand frequency depended phonon transmission through Si nanosheets at low temperatures ($T \sim 0.4$ K) and developing low temperature phonon transport simulations/analytical models that will enable interpreting produced data. Mainly responsible for developing a full scale Monte Carlo simulation of low temperature phonon transport in micro-fabricated phonon spectrometer devices (coded in C++). Also developed a separate analytical model in MATLAB primarily for error-proofing the Monte Carlo simulation. Other responsibilities included: 1) Performing frequency resolved phonon spectrometry experiments at cryogenic temperatures (^3He fridge) utilizing a lock in amplifier, 2) SEM inspections of micro-scale phonon spectrometry devices 3) SEM based size and surface roughness analysis of micro-fabricated Si nanosheets 4) aiding micro-fabrication of phonon spectrometer/Si nanosheet devices in clean room (involves techniques such as photolithography, lift-off, dry-wet etching, thin film deposition, wafer Dicing, wire Bonding).

- *Synthesis of High Efficiency Thermoelectric Materials (09/2008 to 09/2009):*
Developed mesoporous Na_xCoO_2 for thermoelectric applications. Project involved: 1) Synthesis of mesoporous Na_xCoO_2 by using polystyrene microspheres as template, 2) synthesis of porous thin films of Na_xCoO_2 using sol-gel/spin coating method.
*For these 3M projects details are classified.

Marmara Research Center, International Laboratory for High Technologies, The Scientific & Technological Research Council of Turkey (TUBITAK MAM), Kocaeli, Turkey (Supervisor: Prof. Alex Vertii, Prof. Mehmet Ali Gulgun)

- *Millimeter Waveband Technology for Various Optical, Electronic and Medical Applications (06/2007 to 06/2008):*
Production of novel millimeter waveband devices for practical applications. Project involved: 1) Production of high purity YIG (Yttrium Iron Garnet) powders. 2) Growth of thin film and bulk single crystalline YIG structures 3) Study the dispersion characteristics of YIG samples. 4) Investigate the diffraction of spin waves on YIG thin film surface from processed periodic structures.
- *Novel Ferromagnetic Resonance-Based Imaging Devices (06/2006 to 06/2007):*
 - Developing of a ferromagnetic resonance-based microscopy. Responsible for literature survey, data collection and supporting experimental work.
 - Developing of a ferromagnetic resonance-based tomography technique. Responsibilities included: 1) Designing and realizing 2D and 3D surface tomography experiments, including characterization with a network analyzer; 2) performing structural design (with AppCad), simulation (with Ansoft HFSS), and technical drawing (with SolidWorks) of a microstrip transmission line.

Sabanci University, Istanbul, Turkey

- *Phosphorescence persistence in ceramics (10/2006 to 06/2008, supervisor: Assoc. Prof. Dr. Cleva W. Ow-Yang):*
Developing novel ceramic materials with long lasting phosphorescence. Responsibilities included: 1) Gave 12 lectures to team members on quantum mechanical interpretation of phosphorescence phenomenon and crystal field effect on phosphorescence. 2) Data analysis of the structural and optical characterization.
- *FORMULA-G (Summer 2005, supervisor: Prof. Mahmut Faruk Aksit):*
Developing an ingenious solar car for TUBITAK (the Turkish National Science Foundation) FORMULA-G solar car competition. Responsible for design of the front-end wheel connection using Solidworks CAD package and supporting vehicle construction.

IMPORTANT TECHNICAL SKILLS:

- Clean room experience (Cornell Nanofabrication Facility user for 5 years - Photolithography, Lift-off, Dry-wet Etching, Thin film deposition, Wafer Dicing, Wire Bonding).
- Performing frequency resolved low signal to noise spectrometry experiments at cryogenic temperatures (~0.4 K) using lock-in amplifier.
- Coding Monte Carlo simulations with C++.
- Performing analytical modeling with MATLAB.
- Characterizing magnetic field dependent ferromagnetic resonance frequency of thin films using network analyzer.
- Characterization of thermoelectric materials with Seebeck, κ and ρ measurements).

- 2) **Mahmut Aksit**, Richard D. Robinson, “*Misfit transparent Conductive Oxide Films, Methods and Applications*”. U.S. patent application published on Jan 26, 2017 with publication/application no. US 20170025196 A1/ US 15/302,319. (Cornell Uni. Patent)
 - Patent application first filed on Apr 9, 2014 as “*Misfit Transparent Conductive Oxide Films, Methods and Applications*” with U.S. provisional application no. US 61/977,419.
 - Other publication/application no. associated with this patent are WO 2015157513 A1/ PCT/US2015/025100 (international application).
- 3) Kenton D. Budd, Neeraj Sharma, Bill H. Dodge, Daimon K. Heller, Michael A. Haase, **Mahmut Aksit**, “*Particles with Quantum Dots and Method of Making the Same*”. Granted U.S. patent published on July 17, 2018 with publication no. US 10023793 B2. (3M Patent)
 - Patent application first filed on June 3, 2014 with U.S. Provisional Application No. US 62/007,217.
 - Other publication/application no. associated with this patent are WO 2015187490 A1/ PCT/US2015/033230 (international application), US 20170190965 /US 15/313671 (U.S. application), JP 2017520643 /JP 2016571100 (Japanese application), EP 3152275 A1 /EP 20150730328 (European Application), and CN 106414661 A /CN 201580030434 (Chinese Application).
- 4) **Mahmut Aksit**, Kenton D. Budd, Neeraj Sharma, “*Composite Particles Comprising Quantum Dots and Methods of Making the Same*”. International patent application published on Jul 6, 2017 with publication/application no. WO2017117162 A1 /PCT/US2016/068782. (3M Patent)
 - Patent application first filed on Dec 31, 2015 with U.S. Prov. App. No. US 62/273,884.
 - Other publication/application no. associated with this patent are CN 108473860 A /CN 201680077188.7 (Chinese Application).
- 5) Zai-Ming Qui, Kenton D. Budd, **Mahmut Aksit**, Neeraj Sharma, Joseph M. Pieper, “*Curable Quantum Dot Compositions and Articles*”. International patent application published on Jul 6, 2017 with publication/application no. WO2017116820 /PCT/US2016/067661. (3M Patent)
 - Patent application first filed on Dec 31, 2015 with U.S. Prov. App. No. US 62/273,894.
 - Other publication/application no. associated with this patent are CN 108473861 A /CN 201680077298.3 (Chinese Application) and KR 10-2018-0099805 / KR 10-2018-7021800 (South Korean Application).
- 6) Kenton D. Budd, Zai-Ming Qui, **Mahmut Aksit**, Neeraj Sharma, “*Article Comprising Particles with Quantum Dots and Methods of Making the Same*”. International patent application published on Jul 6, 2017 with publication/application no. WO2017117160 A1/ PCT/US2016/068780. (3M Patent)
 - Patent application first filed on Dec 31, 2015 with U.S. Prov. App. No. US 62/273,888.
 - Other publication/application no. associated with this patent are CN 108431172 A /CN 201680077209.5 (Chinese Application) and KR 10-2018-0091933 / KR 10-2018-7021798 (South Korean Application).
- 7) **Mahmut Aksit**, Dipankar Ghosh, “*Nonlinear Composite Compositions, Methods of Making the Same, and Articles Including the Same*”. International patent application published on June 7, 2018 with publication/application no. WO2017063269 / PCT/US2017/063269. (3M Patent)
 - Patent application first filed on Dec 2, 2016 with U.S. Prov. App. No. US 62/429,293.
- 8) Randilynn B. Christensen, Kenton D. Budd, Afshin Falsafi, **Mahmut Aksit**, Jana Ninkovic, Jie Ashley Liu, Mark Benjamin Agre, Masayuki Nakamura, Jason W. Bjork, “*Basic Core Material Encapsulated in an Inorganic Shell Suitable for Use in Biological Carrier Materials*”. International patent application published on June 7, 2018 with publication/application no. WO2018102484 / PCT/US2017/063829. (3M Patent)
 - Patent application first filed on Dec 1, 2016 with U.S. Prov. App. No. US 62/428,752.
- 9) Jae Y. Lee, **Mahmut Aksit**, Ravi Palaniswamy, Antony E. Flor, James F. Poch, Michael A. Meis, “*Air Filtration Monitoring Based on Thermoelectric Devices*”. International patent

application published on Nov 1, 2018 with publication/application no. WO2018198001 / PCT/IB2018/052730. (3M Patent)

- Patent application first filed on Apr 28, 2017 with U.S. Prov. App. No. US 62/491,452.
- 10) **Mahmut Aksit**, Fabian Stolzenburg, “*Acoustically Active Nano-structured Metal Oxides*”. International patent application filed on June 12, 2018 with application no. PCT/IB2018/054250 (3M Patent)
 - Patent application first filed on Apr 28, 2017 with U.S. prov. App. no. US 62/524,013.
 - 11) Craig W. Lindsay, Susannah C. Clear, Kenton D. Budd, **Mahmut Aksit**, Thomas P. Hedblom, “*Nanocrystalline Ceramic Oxide Beads*”. International patent application filed on July 19, 2018 with application no. PCT/IB2018/055395 (3M Patent)
 - Patent application first filed on Jul 28, 2017 with U.S. prov. App. no. US 62/538,226.
 - 12) Ravi Palaniswamy, Antony E. Flor, HongQian Bao, Jamie Angeles, Jae Y. Lee, **Mahmut Aksit**, “*Flexible Thermoelectric Devices*”. Application first filed on Dec 27, 2017 with U.S. provisional application no. US 62/610,537. (3M Patent)
 - 13) Randilynn B. Christensen, Kenton D. Budd, Afshin Falsafi, **Mahmut Aksit**, Jana Ninkovic, Jie Ashley Liu, Mark Benjamin Agre, Masayuki Nakamura, Jason W. Bjork, “*Two-Part Dental Sealant, Method of Applying with a Syringe Device, and Kit*”. Application first filed on June 6, 2018 with U.S. provisional application no. US 62/681567. (3M Patent)
 - 14) Randilynn B. Christensen, Kenton D. Budd, Afshin Falsafi, **Mahmut Aksit**, Jana Ninkovic, Jie Ashley Liu, Mark Benjamin Agre, Masayuki Nakamura, Jason W. Bjork, “*Compositions Comprising Basic Core Material Encapsulated in an Inorganic Shell, Dispensing Devices, and Methods*”. Application first filed on June 6, 2018 with U.S. provisional application no. US 62/681558. (3M Patent)

CONFERENCE PRESENTATIONS:

Fall 2013

- 1) “*Scalable Nanomanufacturing of Electrically Conductive, Ductile, Millimeter-Length Nanosheets of $K_xCoO_2 \cdot yH_2O$* ” **M. Aksit**, B. C. Hoselton, H. J. Kim, D.-H. Ha, R. D. Robinson; poster presentation at the 2013 Materials Research Society (MRS) Fall Meeting, in Boston, MA, USA, 2013.
- 2) “*Is Casimir-Ziman Theory up to the Challenge of Nanostructures? A Monte Carlo Case Study of Low Temperature Phonon Transport and Scattering through Nanosheets*” **M. Aksit**, J. B. Hertzberg, O. O. Otelaja, D. A. Stewart, R. D. Robinson; oral presentation at the 2013 MRS Fall Meeting, in Boston, MA, USA, 2013.
- 3) “*Design and Operation of a Microfabricated Phonon Spectrometer*” O. O. Otelaja, J. B. Hertzberg, **M. Aksit**, R. D. Robinson; oral pres. at the 2013 MRS Fall Meeting, in Boston, MA, USA, 2013.

Fall 2012

- 4) “*Scalable Nanomanufacturing of Millimeter-length 2D K_xCoO_2 Nanosheets for Energy Applications*” **M. Aksit**, H. J. Kim and R. D. Robinson; oral pres. at the 2012 MRS Fall Meeting, in Boston, MA, USA, 2012.
- 5) “*Simulating Low Temperature Phonon Transport and Scattering through Nanosheets as a Guidance to High-efficiency Thermoelectrics*” **M. Aksit**, J. B. Hertzberg, O. O. Otelaja, D. A. Stewart, R. D. Robinson; oral pres. at the 2012 MRS Fall Meeting, in Boston, MA, USA, 2012.
- 6) “*Nanoscale Phonon Transport as Probed with a Microfabricated Phonon Spectrometer for the Study of Nanoscale Energy Transport*” O. O. Otelaja, J. B. Hertzberg, **M. Aksit**, D. A. Stewart, R. D. Robinson; poster pres. at the 2012 MRS Fall Meeting, in Boston, MA, USA, 2012.
- 7) “*Operating Characteristics of a Microfabricated Phonon Spectrometer*” J. B. Hertzberg, O. O. Otelaja, **M. Aksit**, and R. D. Robinson; oral pres. at the 2012 MRS Fall Meeting, in Boston, MA, USA, 2012.

Summer 2012

- 8) “Operation of a non-equilibrium phonon source for probing nanoscale phonon transport” J. B. Hertzberg, O. O. Otelaja, **M. Aksit**, and R. D. Robinson; oral pres. at the Phonons 2012 Annual Conference, in Ann Arbor, MI, USA, 2012.
- 9) “Probing phonon surface scattering in nanostructures using a microfabricated phonon spectrometer” J. B. Hertzberg, O. Otelaja, **M. Aksit**, D. A. Stewart, and R. D. Robinson; oral pres. at the Phonons 2012 Annual Conference, in Ann Arbor, MI, USA, 2012.
- 10) “Simulating low temperature phonon transport and scattering through Si nanosheets” **M. Aksit**, J. B. Hertzberg, O. O. Otelaja, D. A. Stewart, and R. D. Robinson; oral pres. at the Phonons 2012 Annual Conference, in Ann Arbor, MI, USA, 2012.
- 11) “Fabrication methods for a phonon spectrometer designed to spectrally resolve hypersonic phonon transport through nanostructures” O. O. Otelaja, J. B. Hertzberg, **M. Aksit**, and R. D. Robinson; poster pres. at the Phonons 2012 Annual Conference, in Ann Arbor, MI, USA, 2012.

Fall 2011

- 12) “Scalable Nanomanufacturing of Millimeter Length 2D Nanosheets of Thermoelectric $Na_{0.7}CoO_2$ ” **M. Aksit**, D. P. Toledo and R. D. Robinson; oral pres. at the American Institute of Chemical Engineers 2011 Annual Conference, in Minneapolis, MN, USA, 2011.
- 13) “Nanostructural Crystal Growth and Nanocrystalline Porous Material Fabrication through Low-Temperature E-Field Induced Kinetic Demixing” **M. Aksit**, D. P. Toledo and R. D. Robinson; poster pres. at the 2011 MRS Fall Meeting, in Boston, MA, USA, 2011.
- 14) “Synthesis and Characterization of Millimeter Length 2D Nanosheets of Na_xCoO_2 ”. **M. Aksit**, D. P. Toledo and R. D. Robinson; oral pres. at the 2011 MRS Fall Meeting, in Boston, MA, USA, 2011.

Fall 2010

- 15) “Nano-layer Superlattices of $Na_{0.7}CoO_2$ ” **M. Aksit** and R. D. Robinson; oral pres. at the 2010 MRS Fall Meeting, in Boston, MA, USA, 2010.

Fall 2007

- 16) “Low-Cost Synthesis of the Scintillator Compound, Eu- and Dy-Doped $SrAl_{12}O_{19}$ (SA_6), as a Model Material for Electronic Structure Characterization” C. W. Ow-Yang, O. I. Aydin, C. Benel, **M. Aksit**, A. Yurt and M. A. Gulgun; poster pres. at the 2007 MRS Fall Meeting, in Boston, MA, USA, 2007.

OTHER ACADEMIC ACTIVITIES:

- Responsible for lab activities conducted by one Ph.D., one M.Eng. and eight undergraduate students in Robinson Group at Cornell MS&E department.
- Senior researcher in Robinson Lab (2008-Present) at Cornell MS&E department. Responsible for purchasing and maintenance of lab supplies and equipment.
- Teaching assistantship in Cornell University MSE department for Spring 2011 semester.
- Teaching certification: Completed the “Engineering Teaching Assistant Development Program” in the College of Engineering at Cornell University (Spring 2009).
- Involved in Materials Grad-Invited Cornell University Seminar (MAGICUS) group to arrange outside speakers for Cornell University MSE seminars.
- As a senior undergrad lectured 12 classes on quantum mechanical interpretation of phosphorescence phenomenon and crystal field effect on phosphorescence, Sabanci University.

AWARDS & HONORS:

- Cornell Center for Materials Research Microscopy Image Contest: Most artistic image award.
- Full Financial Support (Stipend + Tuition) for Ph.D. education, Cornell University MS&E.
- International ICAM Junior Award (For participation at MRS 2007 Fall Meeting).
- Ranked 1st among students with physics minor degree in Material Science and Engineering Department, Sabanci University.
- High Honor Awards for three terms, Sabanci University.
- Full Honor Scholarship (tuition + stipend) for undergrad education, Sabanci University.
- Ranked 245th in nationwide university entrance exam among 1,451,973 high school graduates.
- As an undergrad initiated collaboration between 4 faculty members from Sabanci University and TUBITAK Marmara Research Center resulting in a successful joint research grant from the “State Planning Agency” with a budget of \$1.5 million.