

Rohat Melik

Feinberg School of Medicine,
Northwestern University,
Radiology Suite 1600, 737 N. Michigan Avenue,
Chicago Illinois 60611

E-Mail: rohat.melik@northwestern.edu
rohat.melik@gmail.com
Web: <http://neuroengineering.etu.edu.tr>

EDUCATION:

Postdoctoral, Electrical Engineering and Computer Science, 2012, **MIT**, Cambridge, MA, USA

Ph.D., Electrical and Electronics Engineering, 2010, **Bilkent University**, Ankara, Turkey

B.S., Electrical and Electronics Engineering, 2004, **Middle East Technical University**, Ankara, Turkey
(also in Economics, minor in International Economics, 2004)

High School, Ankara Science High School, 1999, Ankara, Turkey

GRANTS & FUNDINGS:

PI: Prof. Rohat Melik

- 1) The Scientific and Technological Research Council of Turkey (TUBITAK) 1003. "Smart Nervous System Implants"
Budget: ~300K US Dollars, based on exchange rate when project was accepted (563,760 TL)
Duration: 2 years (Completed)
- 2) The Scientific and Technological Research Council of Turkey (TUBITAK) 1001. "Smart, Passive, Wireless Metamaterial Implants for Early-diagnostics in Orthopaedics"
Budget: ~150K US Dollars, based on exchange rate when project was accepted (255,400 TL)
Duration: 3 years (Completed)
- 3) Republic of Turkey Ministry of Science, Industry and Technology Entrepreneurship (Teknogirişim Desteği). "Wireless Vehicle Ring"
Budget: ~50K US Dollars, based on exchange rate when project was accepted (99,700 TL)
Duration: 1 year (Completed)

PROFESSIONAL EXPERIENCE:

- 2022-present, **Visiting Professor**, Feinberg School of Medicine and Department of Biomedical Engineering, Northwestern University
- 2013-present, **Assistant Professor**, Department of Electrical and Electronics Engineering, TOBB University of Economics & Technology
- 2011-2012, **Postdoctoral Researcher**, Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT)
- 2010, **Postdoctoral Researcher**, Department of Electrical and Electronics Engineering, Bilkent University
- 2004-2010, **Research Assistant**, Department of Electrical and Electronics Engineering, Bilkent University
- 2004-2010, **Research Assistant**, Nanotechnology Research Center, Bilkent University
- 2007-2010, **Research Assistant**, Institute of Material Science and Nanotechnology, Bilkent University
- 2007-2010, selected and promoted to **Coordinator Teaching Assistant**, Department of Electrical and Electronics Engineering, Bilkent University

RESEARCH INTERESTS:

- Electro-Ionic Modulation (EIM)
- Neuroengineering
- Neuromodulation
- Implantable electronics
- Bio-MEMS
- Flexible electronics for biomedical applications
- Wireless sensing

TEACHING:

- ELE 536 Neuroengineering I
- ELE 537 Neuroengineering II
- ELE 201 Circuit Theory I
- ELE 201L Circuit Theory I Laboratory
- ELE 495 Senior Design Project
- ELE 432/532 Antennas and Propagation
- ELE 331 Electromagnetic Wave Theory

THESIS SUPERVISED:

- 1) U. C. Erdogan “Enhancing Electro-Ionic Modulation (EIM) by using PEDOT:PSS”, **Master of Science Thesis** (July 29, 2020).
- 2) B. Sahin “Effect of the polarization of tripolar electrodes on *in-vivo* electrical nerve block”, **Master of Science Thesis** (December 11, 2018).
- 3) Z. Soybas “Electrochemical blocking of sciatic nerve of a frog *in-vivo* using flexible electrodes produced by microfabrication methods”, **Master of Science Thesis** (April 6, 2017).
- 4) S. Simsek “Electrochemical stimulation of sciatic nerve of a frog *in-vivo* using flexible electrodes”, **Master of Science Thesis** (December 19, 2016).

HONORS & AWARDS:

- **Best Paper Award** in 11th International Conference on Biotechnology, Bio Informatics, Bio Medical Sciences and Stem Cell Applications (B3SC) 2016, London, UK, September 2016
- 2010 **Leopold B. Felsen Award** for Excellence in Electromagnetics (announced in *IEEE Antennas and Propagation Magazine* 52, 234 (2010))
http://www.bilkent.edu.tr/~Bilnews/issue_17_17/index.html by Bilkent News
http://www.bilkent.edu.tr/bilkent_dergisi/no15/32-35.pdf by Bilkent Magazine
<http://www.ee.bilkent.edu.tr/main/index.php> by Bilkent EE Department
- **National Graduate Fellowship Award**, The Scientific and Technological Research Council of Turkey (TUBITAK), 2005-2010
- Bilkent University **Full Graduate Scholarship**, 2004-2010
- Middle East Technical University Scholarship (**Full Scholarship**), 1999-2004
- Middle East Technical University **High Honors List**
- National Graduate Record Examination, **ranked 52nd** in >130,000 examinees across Turkey (79.878/80.000 quantitative), 2004

PATENTS:

- 1) **R. Melik**, "Electro-Ionic Modulation (EIM)", US patent pending.
- 2) **R. Melik**, "Electro-Ionic Modulation (EIM)", Turkey patent pending.
- 3) J. Han, Y.-A. Song, **R. Melik**, S. J. Lin, A. M. S. Ibrahim, A. N. Rabie, "Microfabricated Ion-Selective Electrodes for Functional Electrical Stimulation and Neural Blocking", US patent WO2013052793.
- 4) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", US patent US2011152725.
- 5) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", S. Korea patent KR20110044758.
- 6) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", EC patent EP2317912.
- 7) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", Canada patent CA2734690.
- 8) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", China patent CN102123657.
- 9) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", Japan patent pending.
- 10) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", Brazil patent pending.
- 11) H. V. Demir, **R. Melik**, and C. M. Puttlitz, "Biomems Sensor and Apparatuses and Methods Thereof", India patent pending.

PEER REVIEWED JOURNAL ARTICLES:

- 1) U. C. Erdogan, Z. Soybas, S. Simsek, and **R. Melik**, "Enhancement of Electro-Ionic Modulation (EIM) by Using PEDOT: PSS", in preparation.
- 2) U. C. Erdogan, F. M. B. Erol, B. Sahin, Z. Soybas, S. Simsek, and **R. Melik**, "Effect of Polarities on Electrical Nerve Blocking *In-Vivo*", in submission.
- 3) Z. Soybas*, S. Simsek*, F. M. B. Erol, U. C. Erdogan, E. N. Simsek, B. Sahin, M. Marcali, B. Aydogdu, C. Elbuken, and **R. Melik**, "Real-time *in-vivo* control of neural membrane potential by electro-ionic modulation", *iScience* 17, 347–358 (2019). *Equal contribution.
[A Breakthrough Neuromodulation Method Developed at TOBB ETU](#) by TOBB ETU
- 4) A. M. S. Ibrahim, T. L. Gerstle, A. N. Rabie, Y.-A. Song, **R. Melik**, J. Han, & S. J. Lin, "Nanotechnology in Plastic Surgery", *Plast. Reconstr. Surg.* 130, 879e–887e (2012).
- 5) Y.-A. Song, **R. Melik**, A. N. Rabie, A. M. S. Ibrahim, D. Moses, A. Tan, J. Han, & S. J. Lin, "Electrochemical activation and inhibition of neuromuscular systems through modulation of ion concentrations with ion-selective membranes", *Nature Materials* 10, 980–986 (2011).
[Charging toward better neural implants](#) by [MIT News](#)
[Put Nerves Under Ion Control, and Activation Is Yours](#) by Alzheimer Research Forum
[Dismissing gatekeepers for enhanced nerve control](#) by RSC Chemistry World
[Improved method of electrical stimulation could help treat damaged nerves](#) by EurekaLaert.org
- 6) **R. Melik**, E. Unal, N. K. Perkgoz, C.M. Puttlitz, and H. V. Demir, "RF-MEMS Load Sensor with Enhanced Q-factor and Sensitivity in a Suspended Architecture", *Microelectronic Engineering* 88, 247-253 (2011).
- 7) **R. Melik**, E. Unal, N. K. Perkgoz, B. Santoni, D. Kamstock, C.M. Puttlitz, and H. V. Demir, "Nested Metamaterials for Wireless Strain Sensing", *IEEE Journal of Selected Topics in Quantum Electronics (special issue on Metamaterials)* 16, 450-458 (2010).
- 8) **R. Melik**, E. Unal, N. K. Perkgoz, C. Puttlitz, and H. V. Demir, "Metamaterial based telemetric strain sensing in different materials", *Optics Express* 18, 5000-5007 (2010).
[\[BioMedLib Top 10 Articles Published in the same domain.\]](#)
- 9) **R. Melik**, E. Unal, N. K. Perkgoz, C.M. Puttlitz, and H. V. Demir, "Flexible Metamaterials for Wireless Strain Sensing", *Applied Physics Letters* 95, 181105 (2009).
- 10) **R. Melik**, E. Unal, N. K. Perkgoz, C. Puttlitz, and H. V. Demir, "Metamaterial-based wireless strain sensors", *Applied Physics Letters* 95, 011106 (2009).
[\[Also editorially selected for Virtual Journal of Biological Physics Research. \(July 2009\)\]](#)
- 11) **R. Melik**, E. Unal, N. K. Perkgoz, C.M. Puttlitz, and H. V. Demir, "Circular High-Q Resonating Isotropic Strain Sensors with Large Shift of Resonance Frequency under Stress", *Sensors* 9, 9444-9451 (2009).
- 12) **R. Melik** and H.V. Demir, "Implementation of High Quality-Factor On-Chip Tuned Microwave Resonators at 7 GHz", *Microwave and Optical Technology Letters* 51, 497-501 (2009).
- 13) **R. Melik**, N.K. Perkgoz, E. Unal, C.M. Puttlitz, and H.V. Demir, "Bioimplantable passive on-chip RF-MEMS strain sensing resonators for orthopaedic applications", *Journal of Micromechanics and Microengineering* 18, 115017 (2008).

- 14) **R. Melik**, N.K. Perkgoz, E. Unal, Z. Dilli, and H.V. Demir, "Design and Realization of a Fully On-Chip High-Q Resonator at 15 GHz on Silicon", *IEEE Transactions on Electron Devices* 55, 3459-3466 (2008).

PEER REVIEWED CONFERENCE ARTICLES:

- 1) U. C. Erdogan, Z. Soybas, S. Simsek, E. N. Simsek, and **R. Melik**, "Improvement of Electro-Ionic Modulation (EIM) by Using PEDOT: PSS as an Interface", *12th International Conference on Research in Life-Sciences & Healthcare (ICRLSH)* 2020, Bangkok, Thailand (July 17-18 2020).
- 2) B. Sahin*, F. M. B. Erol*, Z. Soybas, S. Simsek, and **R. Melik**, "Effect of the Polarization of Tripolar Electrodes on Electrical Nerve Block *In-Vivo*", *The International Conference on Innovative Research in Science Engineering & Technology (IRSET)*, Belgrade, Serbia (December 15-17 2018). *Equal contribution.
- 3) Z. Soybas*, S. Simsek*, E. N. Simsek, B. Korkmaz, B. Aydogdu, and **R. Melik**, "Microfabricated Flexible Electrodes for Blocking the Sciatic Nerve of a Frog", *11th International Conference on Biotechnology, Bio Informatics, Bio Medical Sciences and Stem Cell Applications (B3SC)* 2016, London, UK (September 21-22 2016). *Equal contribution. [\[Best Paper Award\]](#)
- 4) S. Simsek*, Z. Soybas*, Y. Tatar, M. Marcali, C. Elbuken, B. Aydogdu, and **R. Melik**, "Flexible Electronics for Efficient Nerve Stimulation", *3rd International Conference on Biomedical Engineering and Systems (ICBES'16)*, Budapest, Hungary (August 16-17 2016). *Equal contribution.
- 5) Y.-A. Song, A. Ibrahim, **R. Melik**, A. Rabie, S. Lin, J. Han, "Microfabricated ion-selective micro electrodes for enhanced neuromuscular stimulation", *BioMethods Boston Conference 2011*, Boston, MA, USA (14-15 July 2011).
- 6) **R. Melik**, E. Unal, N. K. Perkgoz, C.M. Puttlitz, and H. V. Demir, "Metamaterial-Based Wireless RF-MEMS Strain Sensors", *IEEE Sensors 2010*, 2173-2176 Hawaii, USA, November 1-4, 2010.
- 7) B. G. Santoni, **R. Melik**, E. Unal, N. Kosku Perkgoz, D. A. Kamstock, S. D. Ryan, W. S. Dernell, H. V. Demir, and C. Puttlitz, "Development and biocompatibility characterization of a bioMEMS sensor for monitoring the progression of fracture healing", *American Society of Mechanical Engineers ASME Summer Bioengineering Conference - SBC2009* Lake Tahoe, California (June 17-21, 2009). Paper SBC2009-206670.
- 8) **R. Melik** and H. V. Demir, "Fabrication and characterization of fully on-chip c-band microwave resonators with increased Q-factor and reduced chip size", *PIERS Cambridge 2008*, Boston, MA (2-6 July 2008).
- 9) O. Akin, E. Unal, **R. Melik**, and H. V. Demir, "Semiconductor nanocrystal quantum dots with permanent dipole moments", *MediNano*, Istanbul (6-7 October 2008).

INVITED LECTURES & SEMINARS:

- 1) **R. Melik**, "Modulation of Ion Concentration *In-Vivo*", **University of Strathclyde**, Glasgow (March 8, 2017).
- 2) **R. Melik**, "Controlling Cellular Membrane Potential *In-Vivo*", **Oxford Brookes University**, Oxford (December 20, 2016).
- 3) **R. Melik**, "Implantable Electronics for Early-Diagnostics and Therapeutics", **KTH Royal Institute of Technology**, Stockholm (June 9, 2014).
- 4) **R. Melik**, "Implantable Electronics for Early-Diagnostics and Therapeutics", **University of Innsbruck**, Innsbruck (June 11, 2013).
- 5) **R. Melik**, "Microfabricated ion-selective micro electrodes for enhanced neuromuscular stimulation", **Harvard Medical School HST Faculty**, Boston (6 October 2011).
- 6) **R. Melik**, "Novel Bio-implant RF-bioMEMS Sensors", **Univ. California, Berkeley** (May 13, 2010).
- 7) **R. Melik**, "Novel Bio-implant RF-bioMEMS Sensors", **Stanford Univ.**, Stanford (May 10, 2010).
- 8) **R. Melik**, "Novel Bio-implant RF-bioMEMS Sensors", **Harvard Univ.**, Boston (April 23, 2010).
- 9) **R. Melik**, "Novel Bio-implant RF-bioMEMS Sensors", **MIT ECE**, Boston (April 22, 2010).

NATIONAL CONFERENCE PRESENTATIONS:

- 1) **R. Melik** and H. V. Demir, "Yüksek Kalite-Faktörü için Tamamıyla Çip Üzerinde Tümlsik Rezonatörlerin Tasarımı, Mikrofabrikasyonu ve Karakterizasyonu", URSI, Antalya (20-22 October 2008).
- 2) **R. Melik** and H. V. Demir, "Tıbbi Uygulamalarda Hassas Mekanik Gerinim Ölçümü için Biyo-Implant RF-MEMS Sensörler", URSI, Antalya (20-22 October 2008).
- 3) O. Akin, E. Unal, **R. Melik**, and H. V. Demir, "Dipole Moment of Semiconductor Nanocrystal Quantum Dots Measured Using RF Techniques", Nanoscience and Nanotechnology Conference (NANOTR IV), Istanbul Technical University, Istanbul (9-13 June 2008).