



Prof. Dr. Berna Ayse Özkale Edelmann

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Nationality: Turkish, Date of birth: 06/09/1988, Marital status: Married, one child

RESEARCH & TEACHING INTERESTS

Broadly-trained chemical, biological, and mechanical engineer, with expertise in nanorobotics, nanotechnology, biomaterials, and bioengineering. Experience includes smart materials synthesis, nanorobotic applications, single cell manipulation technologies, and mechanobiology.

EDUCATION

- 01/2012 – 04/2016** **Ph.D. in Mechanical Engineering**, ETH Zurich.
Thesis: An Electrochemical Approach to the Development of Complex Materials for Nanorobotic Applications
Advisor: Prof. Dr. Bradley J. Nelson
Defense date: 19/04/2016
- 09/2009 – 09/2011** **MSci. in Biomedical Engineering**, ETH Zurich.
- 09/2005 – 09/2009** **B.A. in Chemical Engineering**, Istanbul Technical University (ITU).
- 07/2006 – 08/2006** **Summer term**, Stanford University
- 09/2002 – 09/2005** **Üsküdar American Academy**, High school

WORK EXPERIENCE

- 04/2021 – Present** **Technical University of Munich**
Assistant professorship in Nano- and Microrobotics, tenure track
Electrical and Computer Engineering Department
- 01/2020 – 12/2020** **Harvard University affiliation**
Postdoctoral affiliation with the Mooney Lab for Cell and Tissue Engineering combined with an extended period of maternity leave to bring up my son during his first year of life during which we moved as a family from Boston back to Zurich
- 02/2017 – 12/2019** **Harvard University**
Postdoctoral fellow at the Mooney Lab for Cell and Tissue Engineering
Employer: Prof. Dr. David J. Mooney
- 06/2016 – 12/2016** **EPFL**
Postdoctoral fellow at the MicroBioRobotic Systems Laboratory, half-time employment
Employer: Prof. Dr. Mahmut Selman Sakar

- 06/2016 – 12/2016** **ETH Zurich**
Postdoctoral fellow at the Multi-Scale Robotics Lab, half-time employment
Employer: Prof. Dr. Bradley J. Nelson
- 07/2008** **Pirelli Tire North America**
Internship in Research and Development Department
Employer: Benfei Hu, Senior Manager
- 06/2007** **Boehringer Ingelheim Pharma GmbH&Co. KG**
Internship in Research and Development Department
Employer: Franz Nothelfer, Associate Director

INSTITUTIONAL RESPONSIBILITIES

- 02/2013 – 02/2015** **Frontiers in Research: Space & Time (FIRST), ETH Zurich**
FIRST Cleanroom responsibilities including mentorship and equipment (e-beam evaporator) maintenance.
- 06/2012 – 12/2015** **Multi – Scale Robotics Lab, ETH Zürich**
Electrodeposition laboratory safety and operation officer,
Main responsibilities include training users and equipment maintenance in a laboratory with 12 PhD/Postdocs and 15 bachelor/master students.

APPROVED RESEARCH PROJECTS

- 02/2017 – 08/2018** “Microscale mechanoactuators for manipulating the tumor microenvironment”
Project conducted through the Early Postdoc Mobility Grant awarded by the Swiss National Science Foundation

SUPERVISION EXPERIENCE

- 08/2018 – 03/2019** **Internship Supervision, Harvard University**
Carola Koopman, Master level (Twente University)
- 06/2018 – 08/2018** **Internship Supervision, Harvard University**
Ece Su Ildiz, Bachelor level (Bilkent University)
- 06/2016 – 12/2016** **Internship Supervision, EPFL**
Raquel Parreira, Master level (EPFL)
- 02/2015 – 08/2015** **Internship Supervision, ETH Zurich**
Conor Drinane, Bachelor level (Dublin Institute of Technology)
- 01/2013 – 12/2015** **Master Thesis Supervision, ETH Zurich**
Cécile Rod (2013), Fajer Mushtaq (2014), Titus Bugmann (2015)

TEACHING EXPERIENCE

- 02/2013 – 08/2015** **Teaching assistantship in the course “Nanorobotics”**
Institute of Robotics and Intelligent Systems, ETH Zürich
Employer: Prof. Dr. Bradley Nelson
- Responsibilities included preparing and delivering guest lectures, leading class discussions, supervising practice sessions, developing and grading all assignments, and meeting with students individually (Class size: 30-70 undergraduate and Masters’ students)*

02/2010 – 08/2010 Teaching assistantship in the course “Cell and Molecular Biology for Engineers”

Institute for Biomedical Engineering, ETH Zürich

Employer: Dr. Alfredo Franco-Obregon

Responsibilities included leading class discussions and grading all assignments (Class size: 30 Masters' students)

PUBLICATIONS

1. **B. Özkale**, M. S. Sakar, D. J. Mooney, “Active biomaterials for mechanotransduction”, *Biomaterials* **2021**, 267, 120497.
2. **B. Özkale**, R. Parreira, A. Bekdemir, L. Pancaldi, E. Özelci, C. Amadio, M. Kaynak, F. Stellacci, D. J. Mooney, M. S. Sakar, “Modular soft robotic microdevices for dexterous biomanipulation”, *Lab on a Chip*, **2019**, 19, 778-788.
3. S. Mao, **B. Özkale**, N. J. Shah, K. Vining, T. Descombes, L. Zhang, C. M. Tringides, S. Wong, J. Shin, D. T. Scadden, D. A. Weitz, D. J. Mooney, “Programmable microencapsulation for enhanced mesenchymal stem cell persistence and immunomodulation”, *Proc. Natl. Acad. Sci.*, **2019**, 116, 31, 15392-15397.
4. **B. Özkale**, N. Shamsudhin, T. Bugmann, B. J. Nelson, and S. Pané, “Magnetostriction in electroplated FeCo alloys,” *Electrochemistry Communications* **2017**, 76, 15-19.
5. **B. Özkale**, F. Mushtaq, J. Fornell, G. Chatzipirpiridis, L. Martin, J. Sort, C. M. Müller, E. Pellicer, B. J. Nelson, and S. Pané, “Single step electrosynthesis of NiMnGa alloys,” *Electrochimica Acta* **2016**, 204, 199-205.
6. **B. Özkale**, N. Shamsudhin, G. Chatzipirpiridis, M. Hoop, F. Gramm, X. Chen, X. Martí, J. Sort, E. Pellicer, S. Pané, “Multisegmented FeCo/Cu nanowires: electrosynthesis, characterization and magnetic control of biomolecule desorption,” *Applied Materials and Interfaces* **2015**, 7 (13), 7389-7396.
7. **B. Özkale**, E. Pellicer, M. A. Zeeshan, J. F. López-Barberá, J. Nogués, J. Sort, B. J. Nelson, S. Pané, “One-pot electrosynthesis of multi-layered magnetic metallopolymer nanocomposites,” *Nanoscale* **2014**, 6, 4683-4690.
8. S. Schuerle, I. A. Vizcarra, J. Moeller, M. S. Sakar, **B. Özkale**, A. M. Lindo, F. Mushtaq, I. Schoen, S. Pané, V. Vogel, B. J. Nelson, “Robotically controlled microprey to resolve initial attack modes preceding phagocytosis”, *Science Robotics* **2017**, 2 (2), eaah6094.
9. X. Chen, M. Hoop, N. Shamsudhin, T. Huang, **B. Özkale**, Q. Li, E. Siringil, F. Mushtaq, L. Tizio, B. J. Nelson, S. Pané, “Hybrid magnetoelectric nanowires for nanorobotic applications: fabrication, magnetoelectric coupling, and magnetically assisted in vitro targeted drug delivery”, *Advanced Materials* **2017**, 29, 1605458.
10. A. Blanquer, A. Hynowska, C. Nogués, E. Ibáñez, J. Sort, M. D. Baró, **B. Özkale**, S. Pané, E. Pellicer, B. Leonardo, “Effect of Surface Modifications of Ti₄₀Zr₁₀Cu₃₈Pd₁₂ Bulk Metallic Glass and Ti-6Al-4V Alloy on Human Osteoblasts *In Vitro* Biocompatibility”, *PLoS ONE* **2016**, 11 (5): e0156644.
11. B. Jang, X. Chen, R. Siegfried, J.M. Moreno, **B. Özkale**, K. Nielsch, B.J. Nelson, S. Pané, “Silicon-supported aluminum oxide membranes with ultrahigh aspect ratio nanopores”, *RSC Advances* **2015**, 5, 94283-94289.
12. Golvano-Escobal, **B. Özkale**, S. Suriñach, M. D. Baró, T. Dobrovolska, I. Krastev, S. Pané, J. Sort, Eva Pellicer, “Self-organized spatio-temporal micropatterning in ferromagnetic Co-In films”, *Journal of Materials Chemistry C* **2014**, 2, 8259-8269.
13. O. Ergeneman, C. Peters, M. R. Gullo, L. Jacot-Descombes, S. Gervasoni, **B. Özkale**, P. Fatio, V. J. Cadarso, M. Mastrangeli, S. Pané, J. Brugger, C. Hierold, B. J. Nelson, “Inkjet printed superparamagnetic polymer composite hemispheres with programmed magnetic anisotropy”, *Nanoscale* **2014**, 6, 10495-10499.
14. M. A. Zeeshan, R. Grisch, E. Pellicer, K. E. Peyer, J. Sort, **B. Özkale**, M. S. Sakar, B. J. Nelson, S. Pané, “Hybrid helical magnetic microrobots obtained by 3D template-assisted electrodeposition”, *Small* **2014**, 10, 1284-1288.
15. S. Fusco, F. Ullrich, J. Pokki, G. Chatzipirpiridis, **B. Özkale**, K. M. Sivaraman, O. Ergeneman, S. Pané, B. J. Nelson, “Microrobots: a new era in ocular drug delivery”, *Expert. Opinion on Drug Delivery* **2014**, 11, 1815-1826.
16. S. Pané, **B. Özkale**, K. M. Sivaraman, C. Ruiz-Camps, S. Suriñach, M. D. Baró, B.J. Nelson, J. Sort, E. Pellicer, “Tailoring the physical properties of electrodeposited CoNiReP alloys with large Re content by direct, pulse, and reverse pulse current techniques”, *Electrochimica Acta* **2013**, 96, 43-50.
17. K. M. Sivaraman, **B. Özkale**, O. Ergeneman, T. Lühmann, G. Fortunato, M. A. Zeeshan, B. J. Nelson, S. Pané, “Redox cycling for passive modification of polypyrrole surface properties: effects on cell adhesion and proliferation”, *Advanced Healthcare Materials* **2013**, 2, 591-598.

18. Varea, S. Pané, S. Gerstl, M. A. Zeeshan, **B. Özkale**, B. J. Nelson, S. Suriñach, M. D. Baró, J. Nogués, J. Sort, E. Pellicer, “Ordered arrays of ferromagnetic, compositionally graded Cu_{1-x}Ni_x alloy nanopillars prepared by template-assisted electrodeposition”, *Journal of Materials Chemistry C* **2013**, *1*, 7215-7221.
19. J. Pokki, O. Ergeneman, K. Sivaraman, **B. Özkale**, A.M. Zeeshan, T. Lühmann, B. J. Nelson, S. Pané, “Electroplated porous polypyrrole nanostructures patterned by colloidal lithography for drug-delivery applications”, *Nanoscale* **2012**, *4*, 3083-3088.

PRESENTATIONS

Invited Lectures

- “Dynamic single cell mechanotransduction with optically responsive extracellular matrices,” School of Engineering and Applied Sciences, Harvard University, Cambridge, USA (June 2018)
- “Manipulating cells with nanomaterials”, High school educational program *Bilime Yolculuk*, Turkey (October 2018)
- “Engineering complex materials for nano- and microrobotic applications”, Georgia Institute of Technology, School of Mechanical Engineering, Atlanta, USA (April 2015)
- “Engineering complex materials for nano- and microrobotic applications”, Italian Institute of Technology, Center for Micro-BioRobotics, Italy (March 2015)
- “Engineering at the micro- and nano- scale”, Istanbul Technical University, Chemical Engineering Department, Turkey (February 2014)
- “One-pot synthesis of multilayer magnetic metallopolymer nanocomposite by pulse electrodeposition”, Pulse Plating Seminar, Austria (March 2013)

Conference Talks and Posters

- “Dynamic single cell mechanotransduction with optically responsive extracellular matrices”, Poster, Gordon Research Conference (GRC) on Signal Transduction by Engineered Extracellular Matrices, New Hampshire, USA (July 2018)
- “On-demand magnetically triggered drug release with segmented nanowires”, Talk, Materials Research Society (MRS) Spring Meeting, San Francisco, USA (April 2015)
- “Metallopolymer nanocomposite fabrication by bipolar pulse electrodeposition”, Talk, Micro and Nano Engineering (MNE), Lausanne, Switzerland (September 2014)
- “Fabrication of magnetic polymer composite by electrodeposition”, Poster, Materials Research Center Graduate Symposium, Zurich, Switzerland (July 2012)

AWARDS AND ACHIEVEMENTS

- 2016 Early Postdoc Mobility Fellowship awarded by the Swiss National Science Foundation
- 2012 Best Image Award (3rd place), Materials Research Center Graduate Symposium, ETH Zurich
- 2011 ETH Zurich, Micro and Nano Science Platform (MNSP) Best Interdisciplinary Master Thesis Award Finalist
- 2009 Graduated as 3rd in Chemical Engineering (ITU) bachelor
- 2005 Ranked in top 1% in University entrance exam (Turkey)

MEMBERSHIPS

- 2020 Special Issue Editor of "Nanorobotics for Biomedicine" in *Pharmaceutics* (ISSN 1999-4923)

LANGUAGE SKILLS

Turkish (mother tongue), English (C2), German (B2)