Dr. Mehmet Z. Baykara is an Assistant Professor at the Department of Mechanical Engineering at Bilkent University in Ankara, Turkey, where he has initiated the Scanning Probe Microscopy (SPM) Research Group in Fall 2012 and is conducting research funded by the European Commission as well as TUBITAK.

Dr. Baykara obtained his B.S. degree (*first rank*) in Mechanical Engineering from Boğaziçi University in Istanbul, Turkey in 2006, and his Ph.D. degree from the Department of Mechanical Engineering & Materials Science at Yale University in 2012. His doctoral work on atomic-resolution measurement of chemical interactions has been recognized by the *Materials Research Society* (MRS) and the *American Vacuum Society* (AVS) through graduate student awards, and the associated thesis received the "*2012 Henry Prentiss Becton Graduate Award for Exceptional Achievement in Research*" at Yale University.

Dr. Baykara has co-authored publications in scientific journals such as *Nature Communications*, *Nature Nanotechnology*, *ACS Nano* and *Advanced Materials* and has delivered numerous invited presentations at research institutes and universities around the world.

Dr. Baykara is the recent recipient of the following awards:

- 2015 Junior Chamber International (JCI) Ten Outstanding Young Persons of Turkey Award (TOYP)
- 2015 Science Academy Association Distinguished Young Scientist Award (BAGEP)
- 2014 Outstanding Young Scientist Award of the Turkish Academy of Sciences (TÜBA-GEBİP)
- 2014 FABED Eser Tümen Outstanding Young Scientist Award
- 2013 METU Parlar Foundation Research Incentive Award

Dr. Baykara is a guest editor at the *Beilstein Journal of Nanotechnology* and is a member of the Executive Committee of the *Nanometer-Scale Science and Technology Division of the American Vacuum Society* (AVS-NSTD).

MEHMET Z. BAYKARA

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ACADEMIC POSITIONS

Assistant Professor September 2012 –
Department of Mechanical Engineering
Bilkent University, Ankara, Turkey

Research and Teaching Assistant September 2006 – May 2012
Department of Mechanical Engineering & Materials Science
Yale University, New Haven, USA

EDUCATION

Yale University, School of Engineering and Applied Science, New Haven, CT, USA May 2012
Ph.D. in Mechanical Engineering & Materials Science
Henry Prentiss Becton Prize for Exceptional Achievement in Research

Boğaziçi University, Istanbul, Turkey July 2006
B.S. (*High Honors*) in Mechanical Engineering, *First Rank*

Deutsche Schule Istanbul, Istanbul, Turkey June 2002
ABITUR Diploma, *First Rank*

AWARDS, SCHOLARSHIPS AND FELLOWSHIPS

- Junior Chamber International (JCI) Ten Outstanding Young Persons (TOYP) of Turkey Award 2015
- Science Academy Association Distinguished Young Scientist Award (BAGEP) 2015
- Turkish Academy of Sciences Outstanding Young Scientist Award (TÜBA-GEBİP) 2014
- FABED Eser Tümen Outstanding Young Scientist Award 2014
- METU Prof. Dr. Mustafa Parlar Foundation Research Incentive Award 2013
- Henry Prentiss Becton Prize for Exceptional Achievement in Research 2012
- Materials Research Society (MRS) Graduate Student Award 2011
- Oak Ridge National Lab Travel Award 2010
- American Vacuum Society (AVS) *NSTD* Best Student Paper Award 2009
- Yale University Edward L. Barlow Endowed Fellowship 2007
- Yale University Faculty of Engineering Supplementary Fellowship 2006
- Columbia University Presidential Fellowship (*declined*) 2006
- Boğaziçi University High Honors Certificate 2006
- Deutsche Schule Istanbul Best Graduating Student Award 2002
- DAAD Scholarship for Undergraduate Studies in Germany (*declined*) 2002
- Deutsche Schule Istanbul Tuition Scholarship 1994-2002

JOURNAL PUBLICATIONS

1. Cihan, E., İpek, S., Durgun, E., **Baykara**, **M.Z.**, *Structural Lubricity under Ambient Conditions*, **Nature Communications**, *in press* (2016).

2. Demirbaş, T. and **Baykara**, **M.Z.**, *Nanoscale Tribology of Graphene Grown by Chemical Vapor Deposition and Transferred onto Silicon Oxide Substrates*, Journal of Materials Research, *in press* (2016).

3. **Baykara, M.Z.**, Mönig, H., Schwendemann, T.C., Ünverdi, Ö., Altman, E.I., Schwarz, U.D., *Three-Dimensional Interaction Force and Tunneling Current Spectroscopy of Point Defects on Rutile TiO_2(110)*, Applied Physics Letters **108**, 071601 (2016).

4. Cihan, E., Özoğul, A., **Baykara**, **M.Z.**, *Structure and Nanotribology of Thermally Deposited Gold Nanoparticles on Graphite*, Applied Surface Science **354**, 429-436 (2015), ***cover article*.**

5. Uluutku, B. and **Baykara, M.Z.**, *Artifacts Related to Tip Asymmetry in High-Resolution Scanning Tunneling Microscopy and Atomic Force Microscopy Measurements of Graphitic Surfaces*, Journal of Vacuum Science & Technology B **33**, 031802 (2015), ***cover article*.**

6. Altman, E.I., **Baykara, M.Z.**, Schwarz, U.D., *Noncontact Atomic Force Microscopy: An Emerging Tool for Fundamental Catalysis Research*, Accounts of Chemical Research **48**, 2640-2648 (2015).

7. **Baykara, M.Z.**, Todorovic, M., Mönig, H., Schwendemann, T.C., Rodrigo, L., Altman, E.I., Perez, R., Schwarz, U.D., *Simultaneous Measurement of Multiple Independent Atomic-Scale Interactions Using Scanning Probe Microscopy: Data Interpretation and the Effect of Cross-Talk*, Journal of Physical Chemistry C **119**, 6670-6677 (2015).

8. Karayaylali, P. and **Baykara, M.Z.**, *Analysis of Amplitude Modulation Atomic Force Microscopy in Aqueous Salt Solutions*, Applied Surface Science **318**, 137-141 (2014).

9. Uçar, A., Çopuroglu, M., **Baykara, M.Z.**, Arıkan, O., Suzer, S., *Tribological Interaction between Polytetrafluoroethylene and Silicon Oxide Surfaces*, Journal of Chemical Physics **141**, 164702 (2014).

10. Uluutku, B. and **Baykara, M.Z.**, *Effect of Lateral Tip Stiffness on Atomic-Resolution Force Field Spectroscopy*, Journal of Vacuum Science & Technology B **31**, 041801 (2013).

11. **Baykara, M.Z.**, Todorovic, M., Mönig, H., Schwendemann, T.C., Ünverdi, Ö., Rodrigo, L., Altman, E.I., Perez, R., Schwarz, U.D., *Atom-Specific Forces and Defect Identification on Surface-Oxidized Cu(100) with Combined 3D-AFM and STM Measurements*, Physical Review B **87**, 155414 (2013).

12. Ritter, C., **Baykara, M.Z.**, Stegemann, B., Heyde, M., Rademann, K., Schroers, J., Schwarz, U.D., *Nonuniform Friction-Area Dependency for Antimony Oxide Surfaces Sliding on Graphite*, Physical Review B **88**, 045422 (2013).

13. Mönig, H., Todorovic, M., **Baykara, M.Z.**, Schwendemann, T.C., Rodrigo, L., Altman, E.I., Perez, R., Schwarz, U.D., *Understanding Scanning Tunneling Microscopy Contrast Mechanisms on Metal Oxides: A Case Study*, ACS Nano **7**, 10233-10244 (2013).

14. **Baykara, M.Z.**, Schwendemann, T.C., Albers, B.J., Pilet, N., Mönig, H., Altman, E.I., Schwarz, U.D., *Exploring Atomic-Scale Lateral Forces in the Attractive Regime: A Case Study on Graphite (0001)*, Nanotechnology **23**, 405703 (2012).

15. **Baykara, M.Z.**, Dagdeviren, O.E., Schwendemann, T.C., Mönig, H., Altman, E.I., Schwarz, U.D., *Probing Three-Dimensional Surface Force Fields with Atomic Resolution: Measurement Strategies, Limitations, and Artifact Reduction*, Beilstein Journal of Nanotechnology **3**, 637-650 (2012).

16. **Baykara, M.Z.**, Schwendemann, T.C., Altman, E.I., Schwarz, U.D., *Three-Dimensional Atomic Force Microscopy – Taking Surface Imaging to the Next Level*, Advanced Materials **22**, 2838-2853 (2010), ***inside cover article*.**

17. Albers, B.J., Schwendemann, T.C., **Baykara, M.Z.**, Pilet, N., Liebmann, M., Altman, E.I., Schwarz, U.D., *Three-Dimensional Imaging of Short-Range Chemical Forces with Picometre Resolution*, Nature Nanotechnology **4**, 307-310 (2009).

18. Albers, B.J., Schwendemann, T.C., **Baykara, M.Z.**, Pilet, N., Liebmann, M., Altman, E.I., Schwarz, U.D., *Data Acquisition and Analysis Procedures for High-Resolution Atomic Force Microscopy in Three Dimensions*, Nanotechnology **20**, 264002 (2009).

19. Vaz, C.A.F., Wang , H.Q., Ahn, C.H., Henrich, V.E., **Baykara, M.Z.**, Schwendemann, T.C., Pilet, N., Albers, B.J., Schwarz, U.D., Zhang, L.H., Zhu, Y., *Interface and Electronic Characterization of Thin Epitaxial Co_3O_4 Films*, Surface Science **603**, 291-297 (2009).

20. Albers, B.J., Liebmann, M., Schwendemann, T.C., **Baykara, M.Z.**, Heyde, M., Salmeron, M., Altman, E.I., Schwarz, U.D., *Combined Low-Temperature Scanning Tunneling/Atomic Force Microscope for Atomic Resolution Imaging and Site-Specific Force Spectroscopy*, Review of Scientific Instruments **79,** 033704 (2008).

EDITORIALS

1. **Baykara, M.Z.** and Schwarz, U.D., *Noncontact Atomic Force Microscopy III*, Beilstein Journal of Nanotechnology, *in press* (2016).

2. **Baykara, M.Z.** and Schwarz, U.D., *Noncontact Atomic Force Microscopy II*, Beilstein Journal of Nanotechnology **5**, 289 (2014).

3. Glatzel, T., Hölscher, H., Schimmel, T., **Baykara, M.Z.**, Schwarz, U.D., Garcia, R., *Advanced Atomic Force Microscopy Techniques*, Beilstein Journal of Nanotechnology **3**, 893 (2012).

INVITED BOOK CHAPTERS

1. **Baykara, M.Z.**, Morgenstern, M., Schwarz, A., Schwarz, U.D., "Low-Temperature Scanning Probe Microscopy", *Handbook of Nanotechnology, 4th ed.*, Berlin: Springer (2017), forthcoming.

2. **Baykara, M.Z.** and Schwarz, U.D., "Atomic Force Microscopy: Methods and Applications", *Encyclopedia of Spectroscopy and Spectrometry, 3rd ed.*, Oxford: Elsevier (2016), in press.

3. **Baykara, M.Z.** and Schwarz, U.D., "3D Force Field Spectroscopy", *Noncontact Atomic Force Microscopy, vol. 3*, Berlin: Springer, 9-28 (2015).

4. **Baykara, M.Z.**, "Noncontact Atomic Force Microscopy for Atomic-Scale Characterization of Material Surfaces", *Surface Science Tools for Nanomaterials Characterization*, Berlin: Springer, 273-316 (2015).

BOOKS

- **Baykara, M.Z.**, *Atomic Resolution Force Microscopy and Spectroscopy*, Oxford University Press, forthcoming (2016).

Ph.D. THESIS

- **Baykara, M.Z.**, *Atomic-Resolution Quantification of Chemical Interactions Using Three-Dimensional Atomic Force Microscopy*, Yale University, New Haven, USA (2012).

PATENT APPLICATIONS

1. **Baykara, M.Z.**, *Material System with Sub-Micrometer-Scale Interfaces Exhibiting Structural Lubricity under Ambient Conditions and the Method for Synthesis Thereof*, United States Patent and Trademark Office (USPTO), 1495300.
2. **Baykara, M.Z.**, *Material System with Sub-Micrometer-Scale Interfaces Exhibiting Structural Lubricity under Ambient Conditions and the Method for Synthesis Thereof*, Republic of Turkey Patent Institute (TPE), 2015/07405.

RESEARCH GRANTS

Principle Investigator

1. "Investigating Graphene Covered with Self Assembled Monolayer Structures via STM and Testing Its Use as a Chemical Sensor", *3501 Program*, TÜBİTAK, 2015-2017
2. "Developing an Atomic Force Microscope for Biological Research", *1505 Program*, TÜBİTAK, 2015-2017
3. "Investigating the Effect of Interface Structure on Friction at the Nanoscale", *Career Integration Grant* (*CIG*), Marie Curie Actions of the Seventh Framework Program, European Commission, 2013-2017

Researcher

4. "A Joint Theoretical and Experimental Study on the Nanotribological Properties of the Interface between Au and Two-Dimensional Systems", *1001 Program*, TÜBİTAK, 2015-2018
   (Principle Investigator: Prof. Hande Toffoli, Physics Department, METU)

INVITED TALKS, SEMINARS AND LECTURES

1. **Baykara, M.Z.,** *Nanotribology Experiments on Carbon-Based Materials*, 3rd Emerging 2D Materials & Graphene Conference, Istanbul, Turkey, October 21, 2016.
2. **Baykara, M.Z.,** *Three Decades of Atomic Force Microscopy: Implications for Physics, Chemistry and Biology*, Physical, Biological and Chemical Foundations of Bioelectronics, Biophotonics and Biosensors, Izmir, Turkey, July 29, 2016.
3. **Baykara, M.Z.,** *Real-Space, Atomic-Scale Measurement of Chemical Reactivity on Metal Oxide Surfaces via 3D-SPM*, EMN Spring Meeting 2016, Taipei, Taiwan, March 11, 2016.

4. **Baykara, M.Z.,** *Searching for Structural Lubricity under Ambient Conditions via Nanomanipulation Experiments*, 6th European Nanomanipulation Workshop, Giessen, Germany, September 23, 2015.

5. **Baykara, M.Z.,** *A Crash Course on Nanotribology: Atomic Force Microscopy, Nanoparticles, and Superlubricity*, Koç University, College of Engineering Seminar, Istanbul, Turkey, May 6, 2015.

6. **Baykara, M.Z.,** *Multichannel Scanning Probe Microscopy for the Investigation of Atomic-Scale Surface Chemistry*, Middle East Technical University, Chemistry Department Seminar, Ankara, Turkey, December 12, 2014.

7. **Baykara, M.Z.,** *From Single Atoms to Sliding Nanoparticles: Scanning Probe Microscopes Get to the Point*, Boston University, Mechanical Engineering Department Seminar, Boston, USA, November 14, 2014.

8. **Baykara, M.Z.,** *Advanced Microscopy Techniques: Visualizing the Atomic World*, Bilkent Laboratory and International School (BLIS) – 2014 Science Fair, Ankara, Turkey, January 17, 2014.

9. **Baykara, M.Z.,** *In Pursuit of the Atomic Origins of Friction: Nanotribology Studies via Antimony Nanoparticles*, Bilkent University, 19th Condensed Matter Physics Convention, Ankara, Turkey, December 20, 2013.

10. **Baykara, M.Z.,** *Visualizing Chemical Interactions on Surfaces with Atomic Resolution*, Bilkent University, Chemistry Department Seminar, Ankara, Turkey, May 2, 2013.

11. **Baykara, M.Z.,** *From Single Atoms to Sliding Nanoparticles: Atomic Force Microscopy in Materials Science*, Bilkent University, EESTEC Student Workshop, Ankara, Turkey, February 20, 2013.

12. **Baykara, M.Z.,** *Towards Ultimate Resolution in Atomic Force Microscopy: Atoms and Beyond*, Bilkent University, UNAM AFM/SPM Workshop, Ankara, Turkey, February 4, 2013.

13. **Baykara, M.Z.,** *Force Microscopy Pushed to the Limit: Visualizing Atomic-Scale Interactions on Surfaces*, Boğaziçi University, Physics Department Seminar, Istanbul, Turkey, November 21, 2012.

14. **Baykara, M.Z.,** *Atomic-Scale Measurement of Surface Chemical Interactions*, Istanbul Technical University, Physics Department Seminar, Istanbul, Turkey, November 16, 2012.

15. **Baykara, M.Z.,** *Materials Science on the Atomic Scale: Three-Dimensional Atomic Force Microscopy and its Applications*, Middle East Technical University, Mechanical Engineering Department Seminar, Ankara, Turkey, September 28, 2012.

16. **Baykara, M.Z.,** *Atomic-Resolution Quantification of Chemical Interaction Forces Using Three-Dimensional Atomic Force Microscopy*, Columbia University, Condensed Matter Physics Seminar, New York City, USA, February 3, 2012.

17. **Baykara, M.Z.,** *Visualizing the Nanoworld*, Yale University, 71st Annual Assembly of the Association of Yale Alumni, New Haven, USA, November 17, 2011.

18. **Baykara, M.Z.,** *Materials Science on the Atomic Scale: Three-Dimensional Atomic Force Microscopy and its Applications*, Bilkent University, Mechanical Engineering Department Seminar, Ankara, Turkey, October 28, 2011.

19. **Baykara, M.Z.,** *Tuning Fork Based Low Temperature AFM/STM at Yale University and Three-Dimensional Force/Energy Field Imaging of Graphite*, 2nd EDIS2009 International Symposium on Electronic Devices Innovation, Osaka, Japan, January 15, 2010.

20. **Baykara**, **M.Z.**, *Three-Dimensional Force Imaging and Quantification with Atomic Resolution*, Universidad Autónoma de Madrid, Physics Department Seminar, Madrid, Spain, February 11, 2009.

CONFERENCE PRESENTATIONS

1. Balkanci, A., Ye, Z., Martini, A., **Baykara, M.Z.**, *Nanotribology of Graphene Revisited: The Influence of Contact Size and Substrate Topography*, AVS 63rd International Symposium & Exhibition, Nashville, USA, November 6-11, 2016.

2. Abdelwahab, M.T.H., Kalyoncu, E., Seker, U.O.S., **Baykara, M.Z.**, *Evaluating the Tunable Mechanical Properties of Functional Bacterial Amyloid Nanofibers via Atomic Force Microscopy*, 12th NanoTR Conference, Gebze, Turkey, June 3-5, 2016.

3. Uluutku, B., Afsharimani, N., Saygin, V., **Baykara, M.Z.**, *Comparative Scanning Tunneling Microscopy Study of Self-Assembled Alkanethiol Monolayers on Highly Oriented Pyrolytic Graphite and Single-Layer Graphene*, 12th NanoTR Conference, Gebze, Turkey, June 3-5, 2016.

4. Cihan, E. and **Baykara, M.Z.**, *Superlubric Sliding of Gold Nanoparticles on Graphite under Ambient Conditions*, AVS 62nd International Symposium & Exhibition, San Jose, USA, October 18-23, 2015.

5. **Baykara, M.Z.**, Todorovic, M., Mönig, H., Schwendemann, T.C., Rodrigo, L., Uluutku, B., Altman, E.I., Perez, R., Schwarz, U.D., *Tip Apex Identification, Asymmetry, and Feedback-Induced Cross-Talk in Combined Atomic Force/Scanning Tunneling Microscopy Experiments*, 18th International Conference on NC-AFM, Cassis, France, September 7-11, 2015.

6. Cihan, E. and **Baykara, M.Z.**, *Towards Superlubric Sliding in Ambient Conditions: Structure and Tribology of Gold Nanoparticles on Graphite*, The International Conference on Understanding and Controlling Nano and Mesoscale Friction, Istanbul, Turkey, June 22-26, 2015.

7. **Baykara, M.Z.**, *Nanotribology Studies with Gold Nanoparticles: Superlubricity under Ambient Conditions?*, 4th Condensed Matter Physics Convention, İzmir, Turkey, April 17, 2015.

8. **Baykara, M.Z.**, *High-Resolution Multichannel Scanning Probe Microscopy: 3D Force Field Spectroscopy, Tip Apex Identification, and Cross-Talk*, HR-SPM 2015, Prague, Czech Republic, February 23-24, 2015.

9. Karayaylalı, P. and **Baykara, M.Z.**, *Numerical Analysis of Amplitude Modulation Atomic Force Microscopy in Aqueous Salt Solutions*, AVS 61st International Symposium & Exhibition, Baltimore, USA, November 9-14, 2014.

10. **Baykara, M.Z.**, Ritter, C., Stegemann, B., Heyde, M., Rademann, K., Schroers, J., Schwarz, U. D., *Non-Uniform Friction-Area Dependency for Antimony Oxide Surfaces Sliding on Graphite*, AVS 60th International Symposium & Exhibition, Long Beach, USA, October 27 – November 1, 2013.

11. **Baykara, M.Z.**, Mönig, H., Todorovic, M., Götzen, J., Dagdeviren, O.E., Schwendemann, T.C., Rodrigo, L., Altman, E.I., Perez, R., Schwarz, U.D., *Evolving High-Resolution Scanning Probe Microscopy: Quantitative 3D Imaging and Multi-Channel Data Acquisition*, 2013 ISPM Conference, Dijon, France, June 30 – July 3, 2013.

12. **Baykara, M.Z.**, Dagdeviren, O.E., Schwendemann, T.C., Mönig, H., Altman, E.I., Schwarz, U.D., *Quantitative Atomic-Resolution Surface Force Field Spectroscopy in Three Dimensions*: *A How-To Guide for Collecting Meaningful Data*, 2013 APS March Meeting, Baltimore, USA, March 18-22, 2013.

13. **Baykara, M.Z.**, Mönig, H., Schwendemann, T.C., Todorovic, M., Götzen, J., Dagdeviren, O.E., Ünverdi, Ö., Perez, R., Altman, E.I., Schwarz, U.D., *Pushing Scanning Probe Microscopy to New Frontiers: Higher Resolution, Quantitative Imaging, Additional Data Channels – Status and Visions*, 2012 MRS Fall Meeting & Exhibit, Boston, USA, November 25-30, 2012.

14. **Baykara, M.Z.**, Mönig, H., Schwendemann, T.C., Todorovic, M., Perez, R., Altman, E.I., Schwarz, U.D., *Atomic-Scale Functional Imaging by Combined Scanning Tunneling and Atomic Force Microscopy*, 2011 MRS Fall Meeting & Exhibit, Boston, USA, November 28 – December 2, 2011.

15. **Baykara, M.Z.**, Mönig, H., Schwendemann, T.C., Todorovic, M., Perez, R., Altman, E.I., Schwarz, U.D., *Atom-Specific Interaction Quantification and Identification by Combined Scanning Tunneling and Atomic Force Microscopy*, AVS 58th International Symposium & Exhibition, Nashville, USA, October 30 – November 4, 2011.

16. **Baykara, M.Z.**, Mönig, H., Todorovic, M., Schwendemann, T.C., Perez, R., Altman, E.I., Schwarz, U.D., *Atom-Specific Interaction Quantification and Identification by 3D-SPM*, 14th International Conference on NC-AFM, Lindau, Germany, September 18-22, 2011.

17. **Baykara, M.Z.** and Schwarz, U.D., *Atom-Specific Interaction Quantification and Identification for Catalytic Surfaces Using Three-Dimensional Atomic Force Microscopy*, 71st Physical Electronics Conference, Albany, USA, June 14-17, 2011.

18. **Baykara, M.Z.**, Schwendemann, T.C., Mönig, H., Todorovic, M., Perez, R., Altman, E.I., Schwarz, U.D., *Chemical Imaging and Interaction Quantification on the Surface Oxide Layer of Cu(100) Using High-Resolution Atomic Force Microscopy*, AVS 57th International Symposium & Exhibition, Albuquerque, USA, October 17-22, 2010.

19. **Baykara, M.Z.**, Mönig, H., Schwendemann, T.C., Altman, E.I., Schwarz, U.D., *Chemical Imaging and Interaction Quantification for Catalytic Materials Using High-Resolution Atomic Force Microscopy*, International Workshop on Scanning Probe Microscopy for Energy Applications, Oak Ridge National Labs, Oak Ridge, USA, September 14-17, 2010.

20. **Baykara, M.Z.**, Schwendemann, T.C., Albers, B.J., Pilet, N., Altman, E.I., Schwarz, U.D., *Why Is Graphite So Slippery? Gathering Clues from Atomically Resolved Three-Dimensional Lateral Force Measurements*, AVS 56th International Symposium & Exhibition, San Jose, USA, November 8-13, 2009.

21. **Baykara, M.Z.**, Schwarz, U.D., Schwendemann, T.C., Albers, B.J., Pilet, N., Altman, E.I., *Why Is Graphite So Slippery? Gathering Clues from Three-Dimensional Lateral Force Measurements*, 12th International Conference on NC-AFM, New Haven, USA, August 10-14, 2009.

22. **Baykara, M.Z.**, Schwendemann, T.C., Albers, B.J., Pilet, N., Altman, E.I., Schwarz, U.D., *Three-Dimensional Imaging and Quantification of Short-Range Chemical Forces with Picometer Resolution*, 69th Physical Electronics Conference, New Brunswick, USA, June 16-19, 2009.

→ *In addition*, 28 co-authored talks at seminars and international conferences presented by co-workers.

POSTERS

1. **Baykara, M.Z.**, Mönig, H., Schwendemann, T.C., Ünverdi, Ö., Altman, E.I., Schwarz, U.D., *Probing the Influence of Points Defects on Local Chemical Reactivity and Electronic Properties on TiO_2(110) via 3D-SPM Measurements*, 19th International Conference on NC-AFM, Nottingham, UK, July 25-29, 2016.
2. Süar, Z.M., Çelik, Ü., Oral, A., **Baykara, M.Z.**, *Improving the Mechanical Design of a Liquid Cell for Atomic Force Microscopy*, 12th NanoTR Conference, Gebze, Turkey, June 3-5, 2016.
3. Cihan, E., Kusku, S.I., Durgun, E., **Baykara**, **M.Z.**, *Structural Lubricity under Ambient Conditions*, 611. WE-Heraeus-Seminar: Mechanisms of Tribology, Bad Honnef, Germany, March 29 – April 1, 2016.
4. Demirbaş, T. and **Baykara**, **M.Z.**, *Nanotribological Properties of Graphene Grown by Chemical Vapor Deposition and Transferred onto Silicon Oxide Substrates*, The International Conference on Understanding and Controlling Nano and Mesoscale Friction, Istanbul, Turkey, June 22-26, 2015.
5. Balkancı, A., Demirbaş, T., **Baykara**, **M.Z.**, *Investigating the Nanotribological Properties of Graphene via Atomic Force Microscopy*, 20th Condensed Matter Physics Convention, Ankara, Turkey, December 26, 2014.
6. Cihan, E., Özoğul, A., **Baykara**, **M.Z.**, *Structural and Nanotribological Characterization of Thermally Deposited Gold Nanoparticles*, 20th Condensed Matter Physics Convention, Ankara, Turkey, December 26, 2014.
7. Cihan, E., Özoğul, A., **Baykara**, **M.Z.**, *Structural and Frictional Characterization of Thermally Deposited Gold Nanoparticles*, 30th European Conference on Surface Science (ECOSS), Antalya, Turkey, August 31 – September 5, 2014.
8. Uçar, A., Çopuroglu, M., **Baykara, M.Z.**, Suzer, S., *Tribochemical Interaction between Polytetrafluoroethylene and Silicon Oxide Surfaces*, 30th European Conference on Surface Science (ECOSS), Antalya, Turkey, August 31 – September 5, 2014.
9. Uluutku, B. and **Baykara**, **M.Z.**, *The Effect of Lateral Tip Stiffness on Atomic-Resolution Force Spectroscopy*, 16th International Conference on NC-AFM, College Park, USA, August 5-9, 2013.
10. **Baykara**, **M.Z.**, Dagdeviren, O.E., Schwendemann, T.C., Mönig, H., Altman, E.I., Schwarz, U.D., *Measurement of Surface Force Fields with Atomic Resolution: Methods and Limitations*, 2012 MRS Fall Meeting & Exhibit, Boston, USA, November 25-30, 2012.
11. **Baykara**, **M.Z.**, Mönig, H., Ünverdi, Ö., Altman, E.I., Schwarz, U.D., *Atomic Resolution Imaging and Quantification of Chemical Functionality of Surfaces*, Contractor Meeting of the Catalysis and Chemical Transformation Program, US Department of Energy, Annapolis, USA, October 2-5, 2011.
12. **Baykara**, **M.Z.**, Schwendemann, T.C., Albers, B.J., Pilet, N., Altman, E.I., Schwarz, U.D., *Lattice Site and Distance Dependence of Lateral Forces on Graphite*, 2010 Gordon Research Conference on Tribology, Waterville, USA, June 27 - July 2, 2010.
13. **Baykara**, **M.Z.**, Schwendemann, T.C., Altman, E.I., Schwarz, U.D., *Simultaneous NC-AFM/STM Imaging of the Surface Oxide Layer on Cu(100) and Identification of Lattice Sites*, 12th International Conference on NC-AFM, New Haven, USA, August 10-14, 2009.

14. **Baykara**, **M.Z.**, Albers, B.J., Schwendemann, T.C., Pilet, N., Schwarz, U.D., *Measurement of Lateral Tip-Sample Forces in the Attractive Regime with Picometer Resolution in Three Dimensions Using NC-AFM*, 11th International Conference on NC-AFM, Madrid, Spain, September 16-19, 2008.

→ *In addition*, 13 co-authored posters at seminars and international conferences presented by co-workers.

GRADUATE RESEARCH SUPERVISION

Ongoing

- **Alper Özoğul**, Department of Mechanical Engineering, Bilkent University, (2015 –)
- **Berkin Uluutku**, Department of Mechanical Engineering, Bilkent University, (2015 –)
- **Tarek Abdelwahab**, Department of Mechanical Engineering, Bilkent University, (2014 –)
- **Arda Balkancı**, Department of Mechanical Engineering, Bilkent University, (2013 –)

Completed

- **Ebru Cihan**, *Structure and Nanotribology of Thermally Deposited Gold Nanoparticles on Graphite*, Institute of Materials Science & Nanotechnology, Bilkent University, (2013 – 2015, now Ph.D. student @ KIT)
- **Tuna Demirbaş**, *Nanotribological Properties of Graphene Grown by Chemical Vapor Deposition and Transferred onto Silicon Oxide Substrates*, Department of Mechanical Engineering, Bilkent University, (2013 – 2015)

UNDERGRADUATE RESEARCH SUPERVISION

Ongoing

- **Verda Saygın,** Department of Mechanical Engineering, Bilkent University, TÜBİTAK 2209/A Undergraduate Research Award, (2015 –)
- **Zeynep M. Süar,** Department of Mechanical Engineering, Bilkent University, TÜBİTAK 2209/A Undergraduate Research Award, (2014 –)

Completed

- **Alper Özoğul,** Department of Mechanical Engineering, Bilkent University, TÜBİTAK 2209/A Undergraduate Research Award, (2012 – 2015, now M.S. student @ SPM Group)
- **Berkin Uluutku,** Department of Mechanical Engineering, Bilkent University, TÜBİTAK 2209/A Undergraduate Research Award, (2012 – 2015, now M.S. student @ SPM Group)
- **Pınar Karayaylalı**, Department of Mechanical Engineering, Bilkent University, (2012 – 2014, now Ph.D. student @ MIT)

EDITORIAL APPOINTMENT

- **Guest Editor** at the *Beilstein Journal of Nanotechnology* (since 2012)

JOURNAL REVIEWER APPOINTMENTS

- *Journal of Vacuum Science & Technology B* (since 2009)
- *Surface Science* (since 2010)
- *Measurement Science & Technology* (since 2010)
- *Beilstein Journal of Nanotechnology* (since 2011)
- *Tribology Letters* (since 2011)
- *Applied Surface Science* (since 2013)
- *Journal of Physical Chemistry C* (since 2015)
- *Nanotechnology* (since 2016)
- *Review of Scientific Instruments* (since 2016)

GRANT PROPOSAL REVIEWER APPOINTMENTS

- **Grant Proposal Reviewer**, Netherlands Technology Foundation STW, (2016 –)
- **Grant Proposal Reviewer**, TÜBİTAK, (2014 –)
- **External Consultant**, TÜBİTAK, (2013 –)

MEMBERSHIP IN INTERNATIONAL SOCIETIES

- *American Vacuum Society* (AVS)
  Executive Committee Member of the Nanometer-Scale Science and Technology Division (NSTD)

CONFERENCE & WORKSHOP ORGANIZATION

Chair

- 7th European Nanomanipulation Workshop, Çeşme, Turkey, September 21-23, 2016
- 2nd Graphene and Related Materials Conference (GRM-2016), Ankara, Turkey, July 13-15, 2016

Co-Organizer

- UNAM Nano Colloquium Series, Bilkent University, Ankara, Turkey, Spring & Fall 2016

Member of the Organizing and Scientific Program Committees

- 30th European Conference on Surface Science (ECOSS), Antalya, Turkey, August 31 – September 5, 2014

Member of the Scientific Program Committee

- AVS 63rd International Symposium & Exhibition, Nashville, USA, November 6-11, 2016
- AVS 62nd International Symposium & Exhibition, San Jose, USA, October 22-26, 2015
- 11th NanoTR Conference, Ankara, Turkey, June 22 – 25, 2015

TEACHING EXPERIENCE

Bilkent University

- ME 101: Fundamentals of Mechanical Engineering
- ME 231: Mechanics and Materials I
- ME 232: Mechanics and Materials II
- ME 343: Mechanical Vibrations
- ME 446: Applications of Solid Mechanics
- ME 501: Mathematical Techniques in Mechanical Engineering
- ME 516: Tribology: Friction, Lubrication and Wear

Yale University

- Resident Math and Science Tutor at Timothy Dwight College and the Quantitative Reasoning Center
- Teaching Fellow for MENG 285: Introduction to Materials Science
- Teaching Fellow for MENG 385: Materials Science of MEMS
- Teaching Fellow for MENG 383: Dynamics
- Teaching Fellow for MENG 280: Mechanics of Materials

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Title:

Nanotribology Experiments on Carbon-Based Materials

Authors & affiliations:

Mehmet Z. Baykara
Department of Mechanical Engineering and UNAM-Institute of Materials Science & Nanotechnology, Bilkent University, Ankara 06800, Turkey

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Friction is a universal phenomenon that plays a major role in various technical and industrial processes. Despite its importance from both practical and scientific points of view, the fundamental physical principles that govern friction are still not well-understood. Considering that the ability to predict and control friction on the macroscopic level depends on an elementary understanding of the related mechanisms on much smaller length scales, the research field of *nanotribology* – the science of friction, lubrication and wear on the nanoscale – has been established nearly three decades ago, shortly after the invention of the atomic force microscope (AFM).

In this talk, we will report recent results of AFM-based nanotribology experiments from our laboratory at Bilkent University. In particular, we will focus on experiments conducted on carbon-based materials including highly oriented pyrolytic graphite (HOPG) and graphene. The remarkable discovery of *structurally lubric* sliding (i.e., sliding with ultra-low friction theoretically expected between atomically-flat, molecularly-clean interfaces formed by two crystalline but incommensurate surfaces) exhibited by gold nano islands on HOPG under ambient conditions will be discussed [1]. Moreover, we will outline our efforts on evaluating the nanotribological properties of graphene in detail, by considering both chemical vapor deposition (CVD)-grown and mechanically-exfoliated samples and characterizing frictional behaviour as a function of number of layers, normal load and interface structure [2, 3]. Results presented here help pave the way toward novel lubrication schemes for micro- and nano-scale electromechanical devices that typically suffer from friction-related issues as a result of increasing surface-to-volume ratios.

[1]: Cihan, E., İpek, S., Durgun, E., Baykara, M.Z., *Nature Communications* **7**, 12055 (2016)

[2]: Demirbaş, T., Baykara, M.Z., *Journal of Materials Research*, DOI: 10.1557/jmr.2016.11 (2016)

[3]: Balkanci, A., Ye, Z., Martini, A., Baykara, M.Z., *in preparation* (2016)