Joong Il Jake Choi (최중일) **Dr.techn.**

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Research interests:

Interdisciplinary research in surface science, physical chemistry, materials science, and nanotechnology. Atomic to nanoscale characterization of the geometric, electronic, chemical and mechanical properties of surfaces of metals, metal oxides, semiconductors with both nanoscopic probing and spectroscopy techniques e.g., STM, AFM, XPS, FT-IR, TPD, AES and ISS. Investigation of the pressure effect in surface chemistry using ambient-pressure techniques such as VP-AFM, NAP-STM and NAP-XPS. Recently I have been studying degradation mechanism of organic-inorganic hybrid perovskites which find applications in gas sensors, light-emitting diodes, and solar cells.

Education and Professional Career

2025.09.01 – Present	Assistant Professor Physics Section, School of Open Major, Hannam University
2024.12.01 – 2025.08.25	Postdoctoral Researcher Natural Science Research Institute, Korea Advanced Institute of Science and Technology (KAIST)
2018.07.16 – 2022.12.31	Research Fellow Center for Nanomaterials and Chemical Reactions (CNCR), Institute for Basic Science (IBS), Korea
2016.07.01 – 2018.07.15	Postdoctoral Researcher Institute for Applied Science, Korea Advanced Institute of Science and Technology (KAIST) Supervisor: Prof. Jeong Young Park
2012.01.02 – 2016.04.30	Research Assistant Surface Physics Group, Institute of Applied Physics, TU Wien, Austria
2012.11.15 – 2016.04.22	Ph.D. (Dr.-Studium der techn.) in Surface Science, Institute of Applied Physics, TU Wien, Austria Supervisor: Prof. Michael Schmid
2010.10.04 – 2012.03.20	M.Sc. in Surface Science, Department of Physics, University of Warwick, UK Supervisor: Prof. D. Phil Woodruff FRS
2006.10.02 – 2009.06.27	B.Sc. in Physics, University of Warwick, UK

Professional Activity

- Editorial Board Member, Korean Tribology Society (KTS)
  2021.02.01 ~ Present

List of publications

1. Cho, H.; Kang, W.-B.; Kim, D.; Kim, K.; Choi, J. I. J.; Kim, D.-E.; Kim, H.-J.; Park, J. Y. How Water Makes the Surface Slippery; Friction on Water/Au(111) Investigated with Variable-Pressure Friction Force Microscopy. *ACS Nano* **2025**, *19* (46), 40271–40278.
2. Kim, J. H.; Cho, H.; Yoon, H.; Lee, D.; Choi, J. I. J.; Jung, J. H.; Kim, S. H.; Park, J. Y. Water–Solid Interactions on NaCl: Tracking Adsorption to Deliquescence with in Situ Scanning Probe Microscopy under a Wide Range of Water Vapor Pressure. *J. Chem. Phys.* **2025**, *163* (17), 174706.
3. Choi, J. I. J.; Cho, H.; Park, J. Y. Atomic Scale Friction and Adhesion at Ambient Pressure. *Langmuir* **2024**, 40 (41), 21317–21326.
4. Choi, J. I. J.; Ono, L.; Cho, H.; Kim, K. -J.; Kang, H. -B.; Qi, Y. B.; Park, J. Y. Pathways of Water-Induced Lead-Halide Perovskite Surface Degradation: Insights from In Situ Atomic-Scale Analysis. *ACS Nano* **2023**, 17 (24), 25679–25688. (2022 JIF: 17.1)
5. Kim, Y.; Choi, J. I. J.; Jeong, Y.; Kim, Y. J.; Park, J. Y. In-Situ Imaging of the Electrode Surface during Electrochemical Reactions with a Beetle-Type Electrochemical Scanning Tunneling Microscope. *Current Applied Physics* **2023**, 50, 74–80. (2022 JIF: 2.4)
6. Lee, D. W.; Kong, D. S.; Kim, J. H.; Park, S. H.; Hu, Y. C.; Ko, Y. J.; Jeong, C. B.; Lee, S.; Choi, J. I. J.; Lee, G.-H.; Lee, M.; Wie, J. J.; Chang, K. S.; Park, J. Y.; Jung, J. H. Correlation between Frictional Heat and Triboelectric Charge: In Operando Temperature Measurement during Metal-Polymer Physical Contact. *Nano Energy* **2022**, 103, 107813. (2022 JIF: 17.6)
7. Kim, J.-E.; Choi, J. I. J.; Kim, J.; Mun, B. S.; Kim, K.-J.; Park, J. Y. In-Situ Nanotribological Properties of Ultrananocrystalline Diamond Films Investigated with Ambient Pressure Atomic Force Microscopy. *Journal of Physical Chemistry C* **2021**, 125 (12), 6909–6915. (2022 JIF: 3.7)
8. Choi, J. I. J.; Kim, T.-S.; Kim, D.; Lee, S. W.; Park, J. Y. Operando Surface Characterization on Catalytic and Energy Materials from Single Crystals to Nanoparticles. *ACS Nano* **2020**, 14 (12), 16392–16413. (2022 JIF: 17.1)
9. Choi, J. I. J.; Khan, M. E.; Hawash, Z.; Lee, H.; Ono, L. K.; Qi, Y.; Kim, Y.-H.; Park, J. Y. Surface Termination-Dependent Nanotribological Properties of Single-Crystal $MAPbBr_3$ Surfaces. *Journal of Physical Chemistry C* **2020**, 124 (2), 1484–1491. (2022 JIF: 3.7)
10. Lackner, P.; Choi, J. I. J.; Diebold, U.; Schmid, M. Substoichiometric Ultrathin Zirconia Films Cause Strong Metal–Support Interaction. *Journal of Materials Chemistry A* **2019**, 7 (43), 24837–24846. (2022 JIF: 11.9)
11. Choi, J. I. J.; Khan, M. E.; Hawash, Z.; Kim, K. J.; Lee, H.; Ono, L. K.; Qi, Y.; Kim, Y.-H.; Park, J. Y. Atomic-Scale View of Stability and Degradation of Single-Crystal $MAPbBr_3$ Surfaces. *Journal of Materials Chemistry A* **2019**, 7 (36), 20760–20766. (2022 JIF: 11.9)
12. Kim, J.-E.; Panda, K.; Choi, J. I. J.; Park, J. Y. Nanoscale Investigation of Improved Triboelectric Properties of UV-Irradiated Ultrananocrystalline Diamond Films. *Nanoscale* **2019**, 11 (13), 6120–6128. (2022 JIF: 6.7)

13. Choi, J. I. J.; Kim, J. J.; Oh, W.; Doh, W. H.; Park, J. Y. Ambient-Pressure Atomic Force Microscope with Variable Pressure from Ultra-High Vacuum up to One Bar. *Review of Scientific Instruments* **2018**, 89 (10), 103701. (2022 JIF:1.6)
14. Lackner, P.; Zou, Z.; Mayr, S.; Choi, J.-I. J.; Diebold, U.; Schmid, M. Surface Structures of ZrO_2 Films on Rh(111): From Two Layers to Bulk Termination. *Surface Science* **2019**, 679, 180–187. (2022 JIF: 1.9)
15. Lackner, P.; Hulva, J.; Köck, E.-M.; Mayr-Schmölzer, W.; Choi, J. I. J.; Penner, S.; Diebold, U.; Mittendorfer, F.; Redinger, J.; Klötzer, B.; Parkinson, G. S.; Schmid, M. Water Adsorption at Zirconia: From the ZrO_2(111)/Pt_3Zr(0001) Model System to Powder Samples. *Journal of Materials Chemistry A* **2018**, 6, 17587–17601. (2022 JIF: 11.9)
16. Lackner, P.; Choi, J. I. J.; Diebold, U.; Schmid, M. Construction and Evaluation of an Ultrahigh-Vacuum-Compatible Sputter Deposition Source. *Review of Scientific Instruments* **2017**, 88 (10), 103904. (2022 JIF:1.6)
17. Hwang, J. H.; Lee, H.; Kwon, S.; Jeong, J. H.; Song, H. C.; Choi, J. I. J.; Park, J. Y. Local Conductance Mapping of Water-Intercalated Graphene on Mica. *Applied Physics Letters* **2016**, 109 (24), 241602. (2022 JIF:4)
18. Choi, J. I. J.; Mayr-Schmölzer, W.; Valenti, I.; Luches, P.; Mittendorfer, F.; Redinger, J.; Diebold, U.; Schmid, M. Metal Adatoms and Clusters on Ultrathin Zirconia Films. *Journal of Physical Chemistry C* **2016**, 120 (18), 9920–9932. (2022 JIF: 3.7)
19. Li, H.; Choi, J.-I. J.; Mayr-Schmölzer, W.; Weilach, C.; Rameshan, C.; Mittendorfer, F.; Redinger, J.; Schmid, M.; Rupprechter, G. Growth of an Ultrathin Zirconia Film on Pt_3Zr Examined by High-Resolution X-Ray Photoelectron Spectroscopy, Temperature-Programmed Desorption, Scanning Tunneling Microscopy, and Density Functional Theory. *Journal of Physical Chemistry C* **2015**, 119, 2462–2470. (2022 JIF: 3.7)
20. Choi, J. I. J.; Mayr-Schmölzer, W.; Mittendorfer, F.; Redinger, J.; Diebold, U.; Schmid, M. The Growth of Ultra-Thin Zirconia Films on Pd_3Zr(0001). *Journal of Physics: Condensed Matter* **2014**, 26 (22), 225003. (2022 JIF: 2.7)
21. Duncan, D. A.; Choi, J. I. J.; Woodruff, D. P. Global Search Algorithms in Surface Structure Determination Using Photoelectron Diffraction. *Surface Science* **2012**, 606 (3–4), 278–284. (2022 JIF: 1.9)

List of conference presentations

1. Choi, J. I. J.; Cho, H.; Qi, Y. B. and Park. J. Y. Pathways of water-induced lead-halide perovskite surface degradation: Insights from in situ atomic-scale analysis, 2025.08.28, International Workshop on Scanning Probe Microscopy (IWSPM 2025), Daejeon, Korea
2. Choi, J. I. J. (Invited); Ono, L. K.; Kim, K. J.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Ambient pressure studies on water-induced surface degradation of $MAPbBr_3$, 2022.08.29, International Workshop on Scanning Probe Microscopy (IWSPM 2022), Pohang, Korea
3. Choi, J. I. J.; Ono, L. K.; Kim, K. J.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Ambient pressure studies on water-induced surface degradation of $MAPbBr_3$, 2022.01.09, 13th International Workshop on Oxide Surfaces (IWOX-XIII), Pyeongchang, Korea

4. Choi, J. I. J.; Kim, K. -J.; Ono, L. K.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Atomic-Scale Study of the Degradation Process on Single-Crystal Perovskite Surfaces: From Ultra-High Vacuum to Ambient Pressures, 2021.10.25, AVS67, Virtual Symposium

5. Choi, J. I. J.; Khan, M. E.; Hawash, Z; Lee, H.; Ono, L. K.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Surface Termination-Dependent Nanotribological Properties of Single-Crystal $MAPbBr_3$ Surfaces, 2020.11.29, K-TRIB2020, Korean Tribology Society, Virtual Symposium

6. Choi, J. I. J.; Khan, M. E.; Hawash, Z; Kim, K. J.; Lee, H.; Ono, L. K.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Atomic-scale study of the degradation process on single-crystal hybrid perovskite surfaces: From ultra-high vacuum to ambient pressures, 2019.10.18, IBS-RIKEN Joint Conference, Daejeon, Korea

7. Choi, J. I. J.; Khan, M. E.; Hawash, Z; Kim, K. J.; Lee, H.; Ono, L. K.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Atomic-scale study of the degradation process on single-crystal hybrid perovskite surfaces: From ultra-high vacuum to ambient pressures, 2019.08.26, ACS Fall 2019 National Meeting, San Diego, USA

8. Choi, J. I. J.; Khan, M. E.; Hawash, Z; Lee, H.; Ono, L. K.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Atomic scale view of degradation and surface inhomogeneity of single crystal $MAPbBr_3$, 2019.04.24, 2019 KPS Spring Meeting, Daejeon, Korea

9. Choi, J. I. J.; Khan, M. E.; Hawash, Z; Lee, H.; Ono, L. K.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Atomic-scale Investigation of Degradation of $MA(CH_3NH_3)PbBr_3$ Single Crystal with Ambient Pressure Atomic Force Microscope, 2018.08.20, IUMRS-ICEM 2018, Daejeon, Korea

10. Choi, J. I. J. (invited); Khan, M. E.; Hawash, Z; Lee, H.; Ono, L. K.; Qi, Y. B.; Kim, Y. -H. and Park. J. Y. Nanoscale Investigation of Degradation of $MA(CH_3NH_3)PbBr_3$ with Ambient Pressure Atomic Force Microscopy (Poster), 2018.01.22, International Symposium on Energy Science and Technology (ISEST 2018), Okinawa, Japan

11. Choi, J. I. J.; Diebold, U. and Schmid, M. SMSI in inverse model catalysts: ZrO_2 on Pt and Rh, 2015.09.02, Joint Annual Meeting of ÖPG and SPS, Vienna, Austria

12. Choi, J. I. J.; Mayr-Schmölzer, W.; Mittendorfer, F.; Redinger, J.; Diebold, U. and Schmid, M. Ultra-thin zirconia films on Zr-alloys, 2014.04.03, DPG Spring Meeting, Dresden, Germany

13. Choi, J. I. J.; Valenti, I.; Mayr-Schmölzer, W.; Mittendorfer, F.; Redinger, J.; Diebold, U. and Schmid, M. Water and atomic H adsorption on ultra-thin $ZrO_2/Pt_3Zr(0001)$, 2013.03.13, DPG-Frühjahrstagung, Regensburg, Germany

Awards

1. Platinum Presentation Award, International Symposium on Energy Science and Technology (ISEST 2018), Japan, 2018.01.27