

JUNGMIN MAH

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RESEARCH INTERESTS

Human-Centric Design, Wearable Biomedical Devices, Advanced Sensor Technology, Sensing-feedback system, Soft Sensor Fabrication, Human-Machine Interaction System, Bio-Inspired Biomechanics & Robotics, Microfluidic Systems

EDUCATION

University of Science and Technology (UST)

M.S., Biomedical Engineering

Daejeon, Korea

Sep. 2014 – Aug. 2018

- Thesis: “A Study of Micro-Milling to Fabricate Microfluidic Device for Applying Automated Immunoassay”

Kyung Hee University (KHU)

B.S., Mechanical Engineering

Yongin, Korea

Mar. 2009 – Feb. 2014

- Thesis: “Effects on Live Cells Adjacent to Cancer Cells Inducing Apoptosis through Ultraviolet Irradiation”

San Diego State University (SDSU)

Overseas Training Program

San Diego, CA

Jan. 2010 – Feb. 2010

- Completed “Mechanical Engineering” winter course with scholarship support from KHU

RESEARCH EXPERIENCE

Osstem Implant Co., Ltd.

Research Assistant, Implant R&D Center, Implant Development Team

Seoul, Korea

Apr. 2019 – May. 2024

- Developed key dental implant line-up and user-centric surgical process, *Minimal Invasive Dental Implant System*, set to launch soon
- Redesigned and adjusted dental implant products focused on user experience to sales and productivity (competitor product research, market analysis, and surveys capturing customer feedback and insights)
- Evaluated titanium’s functionality and productivity as a raw material through comprehensive testing
- Standardized dental implant testing procedures to improve reproducibility and experiment results' reliability
- Managed and updated essential documentation, including risk management for medical devices (ISO14971), clinical evaluation reports, and dental implant user manuals

[1] “Development of Dental Implant System using Convergent New Technologies to Overcome Clinical Failures”
(funded by *Ministry of Trade, Industry, and Energy*) *Apr. 2021 – Dec. 2023*

- Analyzed the failure of dental implant system which combined with prosthetic part through mechanical fatigue testing in an experiment
- Identified and characterized the types of dental implant failures using raw data from various clinics

[2] “Development of Titanium Alloy Wire Rods with 50μm-or-Less Roundness for Biomedical and Dental/Orthopedic Implant Applications” (funded by *Ministry of Trade, Industry, and Energy*) *Apr. 2020 – Dec. 2023*

- Applied different types of titanium alloy wire rods to dental implants; evaluated its effectiveness, focusing on productivity, mechanical stability, and biocompatibility

Korea Institute of Science & Technology (KIST)

Seoul, Korea

Research Assistant, Bionics Research Center (Advisor: Prof. Sangyoun Lee)

Sep. 2014 – Aug. 2018

[1] “Vascularized 3D Tissue Chips (Liver, Heart, & Cancer) for Evaluating Drug Efficacy and Toxicity”

(funded by *Ministry of Trade, Industry and Energy*)

Apr. 2016 – Aug. 2018

- Designed the entire evaluation system, integrating 3D tissue culture on chips with the simultaneous detection of chemically emitted materials from the tissues, all in one process
- Constructed a pneumatic pump system to drive microfluidics
- Synthesized magnetic bead-based multiplex immunoassay probes and manipulated them within a microfluidic chip
- Designed and fabricated a microfluidic-based immunoassay detection chip and 3D tissue culture chips using CNC milling machine and soft lithography
- Fabricated a multi-scale channel using a micro-size endmill and several precision machining methods

[2] “Development of Automated Diagnostic Equipment for Rapid Multiplexed Molecular Diagnosis based on Isothermal Amplification” (funded by *Ministry of Health and Welfare*)

Apr. 2016 – Aug. 2018

- Utilized a CNC milling machine to rapidly fabricate and test prototypes, allowing for immediate design adjustments based on iterative feedback
- Designed the construction of thermal insulation part of a device composed of a peltier module and a flexible thermosensor

[3] “Development of an Oligonucleotide-Linked Immunosorbent Assay (OLISA)-based Label-free, Real-time Mesenchymal Stem Cell Aging Measurement System”

(funded by *Ministry of SMEs and Startups*)

Sep. 2014 – Dec. 2017

- Designed and fabricated a microfluidic-based immunoassay detection chip and microfluidic-based MSCs continuous culture chip using CNC milling machine and soft lithography

KHU Optofluidic Nanobio Engineering Lab

Yongin, Korea

Undergraduate Researcher (Advisor: Prof. Won Gu Lee)

Mar. 2013 – Feb. 2014

- Tested cell sensitivity to both physical stimuli and a culture environment to analyze the effects of induced apoptosis on live cells through an experiment

PRESENTATIONS

Oral Presentations (Conferences)

- [1] “Bead-Based Immunoassay in an Automated Microfluidic System,” *The 20th Korean Micro-Electro-Mechanical Systems (KMEMS) Conference*, Jeju Island, Korea, 2018
- [2] “Optimization of Mechanical Micro-Machining Conditions for Micro Mold Fabrication,” *Korean Society of Mechanical Engineers (KSME) Department of Micro/Nano Engineering Spring Conference*, Busan, Korea, 2017
- [3] “Automated Bead-Based Immunoassay via Microfluidic Chip Fabricated with CNC Milling Machine,” *Korean Society of Mechanical Engineers (KSME) 2016 Conference*, Gangwon, Korea, 2016
- [4] “Bead-Based Multiplex Immunoassay in an Automated Microfluidic System,” *Korean Society of Mechanical Engineers (KSME) Department of Micro/ Nano Engineering Spring Conference*, Busan, Korea, 2016
- [5] “Fully Automated Microfluidic System for Multiplexed Immunoassays,” *Korean Society of Mechanical Engineers (KSME) Conference*, Jeju Island, Korea, 2015
- [6] “Size-Selective Microfluidic Valve,” *The 2nd International ASME-JSME-KSME Joint Conference on Fluids Engineering Dynamics (AJK2015-FED)*, Seoul, Korea, 2015

Poster Presentations (Conferences)

- [1] “A Study to Demonstrate the Improvement of KS Implant System Durability,” *International Dental Symposium Osstem Meeting*, Seoul, Korea, 2022
- [2] “Optimization of Micro-Milling Conditions & Post-Processing for Micro Mold Fabrication,” *KSME Department of Micro/Nano Engineering Conference*, Busan, Korea, 2018
- [3] “Microfluidic Valve for Size-Dependent Selection,” *KSME Department of Micro/Nano Engineering Conference*, Busan, Korea, 2015
- [4] “DNA Translocation in Nanochannel-Combined Two-Dimensional Nanopore,” *The 2nd SPIE International Conference on Nano-Bio Sensing, Imaging, & Spectroscopy (NBSIS 2015)*, Jeju Island, Korea, 2015
- [5] “Role of Micro Post Structures in Cell Rolling Dynamics,” *KSME Department of Bio-Engineering Conference*, Gyeongju, Korea, 2014

Research Talks

- [1] “Principle and Application of Computer Numerical Control (CNC),” *Korea Institute of Science and Technology (KIST), Bionics Research Center, Laboratory of Prof. Sangyoun Lee*, 04-Jun-2015
- [2] “Streaming Potential Measurement Technique,” *Korea Institute of Science and Technology (KIST), Bionics Research Center, Laboratory of Prof. Sangyoun Lee*, 17-Sep-2015
- [3] “Principle of Particle Image Velocimetry (PIV) and Micro-PIV,” *Korea Institute of Science and Technology (KIST), Bionics Research Center, Laboratory of Prof. Sangyoun Lee*, 12-Feb-2015

PATENTS

- [1] Kim, I.H., **Mah, J.M.**, “Ampoule Bottle for Storing Fixture, and Fixture Packaging Ampoule Having the Same,” International Patent (IPC), Application No. 10-2021-0036790 (Mar. 2021)
- [2] Kim, I.H., **Mah, J.M.**, “Package Design for Implant Fixture,” Korea Patent, Application No. 30-2021-0008267 (Feb. 2021)
- [3] Chang, K.S., **Mah, J.M.**, “Implant Fixture,” Korea Patent, Application No. 30-2020-0006962 (Jul. 2020)
- [4] Chang, K.S., **Mah, J.M.**, “Implant Fixture,” Korea Patent, Application No. 30-2019-0063317 (Dec. 2019)

AWARDS & SCHOLARSHIPS

Research Fellowship, UST & KIST	Sep. 2014 – Aug. 2018
Best Research Paper Award, Korea Institute of Science and Technology	Dec. 2016
Young Investigator Award, Woman in Science, Engineering, and Technology (WISET) & KSME	Sep. 2016
Best Oral Presentation Award, Micro/Nano Division, Korean Society of Mechanical Engineers	May. 2016
• “Bead-Based Immunoassay in an Automated Microfluidic System”	
Academic Excellence Scholarship, Kyung Hee University	Feb. 2012
Student Representative Scholarship, Kyung Hee University	Oct. 2010
Overseas Training Program Scholarship, Kyung Hee University	Jan. 2010

PUBLICATIONS

**denotes equal contribution with first author*

- [1] Nguyen, T.Q., **Mah, J.M.***, Park, W.T., Lee, S.Y. (2019). “Rapid and Versatile Micromold Fabrication using Micro-Milling and Nano-Polishing for Microfluidic Devices,” *Proceedings of the ASME Fluids Engineering Division Summer Meeting*, AJKFluids2019-5398, V004T06A011 <https://doi.org/10.1115/AJKFluids2019-5398>
- [2] **Mah, J.M.**, Nguyen, T.Q., Mukim, M.S.I., Lee, S.Y. (2018). “Bead-Based Immunoassay in an Automated Microfluidic System,” *Proceedings of the 20th Korean Micro-Electro-Mechanical Systems (KMEMS) Conference*, TO-1-04

- [3] **Mah, J.M.**, Nguyen T.Q., Lee, C.J., Park, W.T., Lee, S.Y. (2018). "Optimize Micro-Milling Condition and Post Process for Micro-Mold Fabrication," *Proceedings of the 2018 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2018, No.5, pp.49
- [4] Nguyen, T.Q., **Mah, J.M.***, Lee, D.W., Mukim, M.S.I., Park, W.T., Lee, S.Y. (2018). "AC Electromagnet Field for Manipulation Magnetic Beads," *Proceedings of the 2018 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2018, No.5, pp.53
- [5] **Mah, J.M.**, Lee, S.Y. (2017). "Optimize Mechanical Micro-Machining Condition to Fabricate Micro Mold," *Proceedings of the 2017 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers (Joint Conference of Two Societies)*, Vol.2017, No.5, pp.15
- [6] Nguyen, T.Q., **Mah, J.M.***, Park, W.T., Lee, S.Y. (2017). "Microfluidic Hanging Drop Device for Controlling Cell Spheroids Density," *Proceedings of the 2017 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers (Joint Conference of Two Societies)*, Vol.2017, No.5, pp.8
- [7] **Mah, J.M.**, Lee, D.W., Lee, S.Y. (2016). "Automated Bead-Based Immunoassay Through Microfluidic Chip Fabricated with Computer Numerical Control Milling Machine," *Proceedings of the 2016 Conference of the Korean Society of Mechanical Engineers*, Vol.2016, No.12, pp.1024-1026
- [8] Nam, K.H., **Mah, J.M.**, Lee, D.W., Lee, S.Y. (2016). "Development of Detection for Single Molecule into Nanofluidic by using Active Optical Grating System," *Proceedings of the 2016 Conference of the Korean Society of Mechanical Engineers*, Vol.2016, No.12, PP.2953-2956
- [9] **Mah, J.M.***, Lee, S.Y. (2016). "Bead-Based Multiplex Immunoassay in an Automated Microfluidic System," *Proceedings of the 2016 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2016, No.5, pp.8
- [10] Nam, K.H., **Mah, J.M.**, Lee, D.W., Kim, K.Y., Lee, S.Y. (2016). "Active Optical Grating System for High-Throughput Single Molecule Detection," *Proceedings of the 2016 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2016, No.5, pp.13
- [11] Maeng, J.H., **Mah, J.M.***, Lee, D.W., Ahn, D.R., Lee, S.Y. (2015). "Fully Automated Microfluidic System for Multiplexed Immunoassay," *Proceedings of the KSME 70th Anniversary Conference*, Vol.2015, No.11, pp.2229-2231
- [12] Nam, K.H., **Mah, J.M.**, Maeng, J.H., Lee, D.W., Kim, K.Y., Lee, S.Y. (2015). "Development of High-Resolution Interference Pattern System for Detection of the Single Molecule in Nanofluidic Channel," *Proceedings of the 70th Anniversary Conference of the Korean Society of Mechanical Engineers*, Vol.2015, No.11, pp.3268-3270
- [13] Maeng, J.H., **Mah, J.M.***, Lee, S.Y. (2015). "Size-Selective Microfluidic Valve," *Proceedings of ASME-JSME-KSME Joint Fluids Engineering Conference 2015*, AJK2015-FED, S18-4-4, 18184.
- [14] Maeng, J.H., **Mah, J.M.***, Cha, B.J., Shin, H.J., Lee, S.Y. (2015). "DNA Translocation in Nanochannel-Combined Two-Dimensional Nanopore," *Proceedings of SPIE's the 2nd Nano-Bio-Sensing imaging & Spectroscopy Conference*, NBSIS 2015, W-PT-I
- [15] Kim, K.S., **Mah, J.M.***, Koo, J.M., Lee, W.G. (2014). "Role of Micro Post Structures in Cell Rolling Dynamics," *Proceedings of the 2014 Spring Conference of the Bioengineering Division, The Korean Society of Mechanical Engineers*, Vol.2014, No.4-4, pp.72

EXTRACURRICULAR ACTIVITIES

Company Club Activity, Billiard Club: 'Dangshin-gwa Hamkke', Osstem Implant Co., Ltd.	2023 – 2024
Company Club Activity, Rock Band: 'Osseointegration', Guitarist & Vocalist, Osstem Implant Co., Ltd.	2019 – 2020
Fourth Place, Swimming Contest, The 21 st Seodaemun District Mayor's Cup	Sep. 2023
Grand Prize, Safety Transportation Culture, Daegu User Content Creation Contest	Nov. 2018
Researcher Club Activity, Rock band: 'K-band', Electric Guitarist & Vocalist & Drummer, KIST	2016 – 2017
Speaker, "Automata: Science & Art" Seminar for Teenagers, Nanumirak	Oct. 2015
Passed the First Round, "Long-acting Therapeutic Protein," Campus Patent Universiade	Aug. 2013

<i>Sophomore Representative</i> , KHU Department of Mechanical Engineering	2010 – 2011
<i>Mathematics Tutor</i> for High School Students	2009 – 2014
<i>Korean Language and Culture Guide</i> for International Students; Finland, Vietnam, Türkiye, KHU	2009
<i>Amateur Band: 'Rump'</i> , Electric Guitarist & Backup Vocalist, GEEK Live House Rock Concert	Dec. 2009
<i>Volunteer in Rural Area</i> , Assist with farming tasks, KHU	May. 2010

TECHNICAL SKILLS

Equipment: CNC Milling Machine, Manual Lathe, Confocal microscopy, 3D Laser Confocal Profiler, Mechanical Testing System (Instron), SEM, Sand Blasting Machine, Optical setup

Software: AutoCAD, SolidWorks, VisualMILL CAM, MATLAB, COMSOL Multiphysics

Fabrication: Micromachining, Soft lithography, Photolithograph

Chemical & Biological: Nano/Micro-particle synthesis, Primary/Cell-line culture, Live-cell imaging, ELISA, Immunofluorescence, Immunocytochemistry, Quantum Dot-based immunoassay, Oligonucleotide-linked Immunosorbent Assay (OLISA), Electroporation

ADDITIONAL INFORMATIONS

Certificate

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| [1] <i>Certificate of Completion in ISO 14971:2019/ ISO TR 24971:2020 Risk Management Training Course</i> , DNV Business Assurance Korea Ltd. | Jun. 2021 |
| [2] <i>Certificate of Completion in Basic GMP Training for Medical Devices</i> , Korea Human Resource Development Institute for Health & Welfare (KoHI) | Nov. 2020 |
| [3] <i>Certificate of Completion in SolidWorks Training</i> , Maven Co., Ltd. | May. 2019 |
| [4] <i>Open Water Scuba Diver Certification</i> , Scuba Diving International Korea | Aug. 2009 |