Doohee Lee

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SKILLS OVERVIEW

- Extensive knowledge and experience in materials engineering and catalyst science, with a deep understanding of the fundamental concepts and their applications.
- Proficient in using a wide range of characterization tools, including SEM, XRD, TEM, AFM, etc., to analyze materials and study their properties.
- A highly self-motivated individual with strong analytical and technical problem-solving skills, able to find innovative solutions to complex challenges.
- Hands-on experience in the manufacturing, development process, and quality control, with a track record of successfully delivering projects from conception to completion.

EDUCATIONS

Ph.D. in Materials Engineering *2016 - 2022*
Auburn University, Auburn, AL, USA GPA 3.9
M.S in Materials Science and Engineering *2012 - 2014*
State University of New York at Stony Brook, NY, USA GPA 3.7
B.S in Materials Chemistry and Engineering *2006 - 2010*
KonKuk University, Seoul, South Korea GPA 3.4

EXPERIENCES

Research Assistant *2016 - Present*
Auburn University, AL, USA - Micro Nano Systems and Materials Research Lab
Development Specialist *2014 – 2016*
CNJ, INC., Auburn, AL, USA – Automotive manufacturer for Hyundai
Research Assistant *2013 - 2014*
Stony Brook University, NY, USA - Smart Materials and Nano-technology Lab

TECHNICAL SKILLS

Characterization - Scanning Electron Microscopy (SEM), Electron Dispersive Spectroscopy (EDS), X-ray Diffractometer (XRD), Atomic Force Microscopy (AFM), and Universal Testing tool
Fabrication - PVD sputtering, Electrophoretic deposition, Electrodeposition, and Hydrothermal synthesis
Analysis - Electrochemical measurement, Gas sensing measurement tool
Prototyping - Hands-on experience of FDM 3D printing technique of prototype samples with self-designed modeling objects with 3D tools (Solidworks, and blender)
Maintenance - Capability of setup and maintenance of the equipment with an understanding of the mechanism of each machine.

RESEARCH INTERESTS

Thin-film deposition (Sputtering, EPD, ED), Catalyst, Environmental-friendly Paper-based sensors, Smart devices in areas of energy harvesting (PEM fuel cell), Electrochemical sensor, Gas sensor, Research analysis, and characterization

RESEARCH and ACHIEVEMENTS

Design of Paper-based Sensor for Urea Detection 2020 - 2021

Designed and developed a flexible, economical, and environmentally friendly urea sensor, resulting in a novel solution that addressed a key challenge in the field of biosensors. The sensor showed promising results in detecting urea levels with high accuracy and precision.

Catalyst Synthesis Study for Electrochemical Sensor 2018 - 2019

Conducted a chemical synthesis study of NiO for an efficient urea sensor, resulting in a more organized and complex catalyst shape for easier detection. This research project resulted in two folds increase in the efficiency of urea detection compared to previous methods and being prepared in a leading international journal.

Simulation Study for PEMFC 2017- 2018

Conducted simulation study for a PEMFC, including modeling and design of flow channel and evaluating its effectiveness using ANSYS Fluent. The simulation results showed improved performance in terms of fuel efficiency, output power and stability, demonstrating a strong grasp of simulation techniques and fuel cell design.

Protective Coating for Bipolar Plate in PEMFC 2016 - 2017

Developed a protective coating process for bipolar plate in PEMFC using EPD of TiN to prevent corrosion from an engineering perspective. The coating process was demonstrated to effectively prevent corrosion and improve the durability of the fuel cell, leading to a longer lifespan for the device.

Mechanical Property of 3D printed Structure 2012 - 2014

Studied the mechanical properties of 3D-printed PLA honeycomb structures, including behavior of deformation. The findings from this research project have been applied in the development of lightweight, low-cost and sustainable structural materials in various industrial applications, demonstrating expertise in mechanical engineering and materials science.

ACTIVITIES AND AWARDS

AU Materials Engineering Graduate Student Service Award 2022

Excellence in service of characterization equipment to materials engineering at Auburn university

Korean-American Scientists and Engineers Association (KSEA) *2018 - 2021*

Student President (AL chapter)

Graduate Research and Travel Fellowship *2018*

Electrochemical Society (ECS) 233rd meeting

Mechanical Engineering Graduate Student Poster Contest *2017*

2nd place at sensor division

TEACHING EXPERIENCES

Material Characterization Lab, *Auburn University (MATL-6201)* 2019 - 2021

Lab class for providing practical experience with a variety of materials characterization techniques for the research of materials engineering (XRD, SEM, OM, and AFM)

Introduction to Material Science, *Auburn University (MATL-2100)* 2016 - 2018

CES software for a successful choice of materials and processes for the optimal design of a research project

LISTS OF PUBLICATIONS

1. Wu, G., Du, H., Cha, Y. L., Lee, D., Kim, W., Feyzbar-Khalkhali-Nejad, F., ... & Kim, D. J. (2022). A wearable mask sensor based on polyaniline/CNT nanocomposites for monitoring ammonia gas and human breathing. Sensors and Actuators B: Chemical, 132858.
2. Yoon, J., Lee, D., Lee, Y. N., Yoon, Y. S., & Kim, D. J. (2019). Solid solution palladium-nickel bimetallic anode catalysts by co-sputtering for direct urea fuel cells (DUFC). Journal of Power Sources, 431, 259-264.
3. Yoon, J., Lee, D., Lee, E., Yoon, Y. S., & Kim, D. J. (2019). Ag/ZnO Catalysts with Different ZnO Nanostructures for Non-enzymatic Detection of Urea. Electroanalysis, 31(1), 17-21.
4. Lee, D., Yoon, J., Lee, E., Woo, S. P., Yoon, Y. S., & Kim, D. J. (2018). NiO Nanostructured Catalysts by AC EPD for Non-Enzymatic Urea Sensors. ECS Transactions, 85(13), 1425-1431.
5. Lee, E., Lee, D., Yoon, J., Yin, Y., Lee, Y., Uprety, S., ... & Kim, D. J. (2018). Enhanced Gas-Sensing Performance of GO/TiO2 Composite by Photocatalysis. Sensors, 18(10), 3334.
6. Lee, D., Lee, E., Yoon, J., Keith, B., Oh, T. S., Woo, S. P., ... & Kim, D. J. (2017). Electrophoretic Deposition of Titanium Nitride onto 316 Stainless Steel as a Bipolar Plate for Fuel Cell Application. ECS Transactions, 80(10), 851-857.
7. Yoon, J., Lee, E., Lee, D., Oh, T. S., Yoon, Y. S., & Kim, D. J. (2017). Communication—Highly Sensitive Ag/ZnO Nanorods Composite Electrode for Non-Enzymatic Urea Detection. Journal of The Electrochemical Society, 164(12), B558-B560.

CONFERENCES

1. Lee, D., Wu, G., Kim, W., Cha, Y., & Kim, D. J. (2022, July). (Digital Presentation) Paper-Based Sensor for Monitoring Urea Oxidation Using Hierarchical Nickel Cobalt Oxide. In ECS Meeting Abstracts (No. 52, p. 2173). IOP Publishing.
2. Lee, D., Yoon, J., Lee, E., Yoon, Y. S., & Kim, D. J. (2019, September). Non-Enzymatic Electrooxidation of Urea with a Disposable Paper-Based Sensor Using Hierarchical NiO Hollow Sphere. In *ECS Meeting Abstracts* (No. 51, p. 2227). IOP Publishing. *Oral presentation*
3. Yoon, J., Lee, D., Lee, E., Yoon, Y. S., Wang, Y., & Kim, D. J. (2019, May). Non-Enzymatic Urea Biosensor Based on Silver-Nickel Oxyhydroxide Nanorods Composite Electrode. In Meeting Abstracts (No. 42, pp. 2048-2048). The Electrochemical Society. *Poster presentation*
4. Lee, D., Yoon, J., Lee, E., Woo, S. P., Yoon, Y. S., & Kim, D. J. (2019, May). Enhanced Electro-Oxidation of Urea Using Hollow Structured Nickel Manganese Oxide Catalysts. In Meeting Abstracts (No. 42, pp. 2047-2047). The Electrochemical Society. *Poster presentation*
5. Lee, E., VahidMohammadi, A., Lee, D., Yoon, J., Beidaghi, M., Yoon, Y. S., & Kim, D. J. (2019, May). Development in Two-Dimensional Nanomaterials for Wearable Health Monitoring Systems. In Meeting Abstracts (No. 44, pp. 2075-2075). The Electrochemical Society. *Oral presentation*
6. Lee, E., Lee, D., Yoon, J., Yoon, Y. S., & Kim, D. J. (2018, July). Two-Dimensional Nanostructured Materials and Their Hybrids for High Performance Wearable Gas Sensors. In *Meeting Abstracts* (No. 57, pp. 2041-2041). The Electrochemical Society. *Oral presentation*
7. Yoon, J., Lee, D., Lee, E., Woo, S. P., Yoon, Y. S., Wang, Y., & Kim, D. J. (2018, April). Sputtering of Nickel-Palladium Bimetallic Anode Catalysts for Direct Urea/Urine Fuel Cell (DUFC) Application. In *Meeting Abstracts* (No. 38, pp. 2253-2253). The Electrochemical Society. *Poster presentation*
8. Yoon, J., Lee, D., Lee, E., Woo, S. P., Yoon, Y. S., Wang, Y., & Kim, D. J. (2018, April). Non-Enzyme Urea Sensing with Ag

Covered ZnO with Different Morphologies on Carbon Papers. In *Meeting Abstracts* (No. 42, pp. 2430-2430). The Electrochemical Society. *Oral presentation*

9. Lee, D., Yoon, J., Lee, E., Woo, S. P., Yoon, Y. S., & Kim, D. J. (2018). NiO Nanostructured Catalysts by AC EPD for Non-Enzymatic Urea Sensors. *ECS Transactions*, *85*(13), 1425-1431. *Poster presentation*
10. Lee, E., Lee, D., Yoon, J., Yoon, Y. S., Prorok, B. C., & Kim, D. J. (2018, April). A Comparative Study on Gas Sensing Performance of Photo-Reduced GO with TiO2 and ZnO. In *Meeting Abstracts* (No. 42, pp. 2457-2457). The Electrochemical Society. *Poster presentation*
11. Yoon, J., Lee, E., Lee, D., Oh, T. S., Woo, S. P., Yoon, Y. S., & Kim, D. J. (2017, September). Non-enzymatic urea detection via using Ag/ZnO nanorod-based catalyst. In *Meeting Abstracts* (No. 49, pp. 2107-2107). The Electrochemical Society. *Oral presentation*
12. Lee, E., Mohammadi, A. V., Lee, D., Yoon, J., Lincoln, C., Beidaghi, M., ... & Kim, D. J. (2017, September). Exploration of New Two Dimensional Titanium Carbides for Room Temperature Gas Sensors. In *Meeting Abstracts* (No. 49, pp. 2092-2092). The Electrochemical Society. *Oral presentation*
13. Lee, E., Yoon, J., Lee, D., Woo, S., Yoon, Y., Wang, Y., ... & Kim, D. J. (2017, September). Direct Conversion Fuel Cell of Urine in Animal Wastes and Its Condition Monitoring Sensors for Efficient Water Usage in Agriculture. In Meeting Abstracts (No. 56, pp. 2347-2347). The Electrochemical Society. *Poster presentation*
14. Lee, D., Lee, E., Yoon, J., Keith, B., Oh, T. S., Woo, S. P., ... & Kim, D. J. (2017). Electrophoretic Deposition of Titanium Nitride onto 316 Stainless Steel as a Bipolar Plate for Fuel Cell Application. *ECS Transactions*, *80*(10), 851-857. *Poster presentation*
15. Lee, E., Chung, Y., Lee, D., Yoon, J., Lincoln, C., Prorok, B. C., ... & Kim, D. J. (2017). Integration of Graphene Oxide on Nylon/Polyester/Cotton Fabrics for a Wearable Electronic Nose Sensor. *Ecs Transactions*, *77*(11), 1711-1717. *Oral presentation*
16. Lee, E., Chung, Y., Lee, D., Yoon, J., Lincoln, C., Prorok, B. C., ... & Kim, D. J. (2017, April). A Wearable Gas Sensor of GO and TiO2 Composite with High Selectivity. In *Meeting Abstracts* (No. 41, pp. 1900-1900). The Electrochemical Society. *Oral presentation*
17. Chung, Y., Lee, E., Lee, D., Yoon, J., Lincoln, C., Prorok, B. C., ... & Kim, D. J. (2017, April). Tailored Nickel Oxide Nanorods Via Hydrothermal Growth for Gas Sensors and Electrocatalysts. In *Meeting Abstracts* (No. 41, pp. 1892-1892). The Electrochemical Society. *Oral presentation*