

Curriculum Vitae

Jin-Ho Bae

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AREAS OF RESEARCH

- Density functional theory of ion exchange in-between cement phases and reactive ions
- Reactive molecular dynamics of organic-/inorganic- nanocomposites
- Micromechanics of ellipsoidal inclusion-reinforced composites
- Hierarchical multi-scale modeling of nanocomposites
- Physics-informed neural networks for mechanics, dynamics, and chemistry

EDUCATION

Ph.D. in Civil and Environmental Engineering Feb, 2025
Korea Advanced Institute of Science and Technology, South Korea (Advisor: Professor H.K. Lee)
Dissertation title: Hierarchical multiscale models for predicting the physicochemical characteristics of cementitious materials exposed to reactive ions

M.S. in Naval Architecture and Ocean Engineering Feb, 2020
Pusan National University, South Korea (Advisor: Professor J.M. Lee)

B.S. in Naval Architecture and Ocean Engineering Feb, 2017
Pusan National University, South Korea

PROFESSIONAL EXPERIENCE

2025.03 - Present	Department of Mechanical Engineering, UNIST, South Korea KAIST InnoCORE PRISM-AI Center, KAIST, South Korea Postdoctoral Research Scientist
2025.03 - 2025.08	Applied Science Research Institute, KAIST, South Korea Postdoctoral Research Scientist
2025.02	National Research Foundation of Korea, South Korea Expert Consultation
2025.02	Chungbuk National University, South Korea Expert Consultation
2020.08 - 2025.02	Korea Advanced Institute of Science and Technology, South Korea Graduate Research Assistant
2016.03 - 2017.02	Pusan National University, South Korea Research Assistant

COURSES TAUGHT

Korea Advanced Institute of Science and Technology, South Korea

- Mechanics of Composite Materials: Fall 2021, Fall 2022
- Reinforced Concrete and Laboratory: Spring 2021

Pusan National University, South Korea

- Engineering Experiments in Engineering: Spring 2017

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AWARDS AND HONORS

- SUPERIOR GRADUATE STUDENT, Brain Korea 21, Pusan National Univeristy, Feb, 2020.
- BEST ORAL PAPER, Korea Society for Composite Materials, Dec, 2019.
- BEST ORAL PAPER, Korea Society for Composite Materials, May, 2019.
- BEST ORAL PAPER, Korea Society for Composite Materials, Dec, 2018.

PEER-REVIEWED INTERNATIONAL JOURNAL PUBLICATIONS

1. Shimelis, E., Jeon, H., Cho, S., Bang, J., **Bae, J. H.**, Kim, G. M., Jang, D., Yang, B. (2025). Design optimization of metastructures integrating machine learning with energy-based homogenization. *Journal of Materials Research and Technology*, *Accepted*.
2. Seo, J., Park, S., Kim, N., Yoon, H. N., Kim, S., **Bae, J. H.**, Jang, D., Cho, A., Lee, H. K. (2025). Characterization of hydrates in quaternary Portland cement-blast furnace slag-calcium sulfoaluminate clinker-limestone or gypsum systems: Experimental and thermodynamic modeling approaches. *Cement and Concrete Composites*, 162, 106126.
3. **Bae, J. H.**, Kil, T., Yun, T., Yang, B. (2025). An intricately designed modeling of concrete carbonation utilizing reactive molecular dynamics and micromechanics. *Construction and Building Materials*, 489, 142297.
4. **Bae, J. H.**, Kil, T., Moon, S., Lee, M. W., Yang, B. (2025), Reactive atomistic molecular dynamics simulations of interfacial damage phenomena in graphene/epoxy nanocomposites. *Composites Science and Technology*, 270, 111289.
5. **Bae, J. H.**, Kim, N.R., S.H. Kim, Seo, J.H. (2025), Multi-species flow and reactive transport processes of seawater into a cement matrix simulated via Bayesian physics-informed neural networks. *Cement and Concrete Composites*, 106205.
6. **Bae, J. H.**, Jang, D., Kim, N., Park, J., Choi, S., Kim, S., Seo, J. (2025). Microstructural changes in carbonation-cured slag-blended calcium sulfoaluminate cements under electrically accelerated leaching, *Developments in the Built Environment*, 100664.
7. Seo, J., Park, J. H., **Bae, J. H.**, Kim, N. R., Cho, A.L., Jang, D.I., Lee, H. K. (2024). Transformation in the reaction products and properties of carbonation-cured CSA cements exposed to a sulfate attack. *Journal of CO₂ Utilization*, 89, 102964.
8. **Bae, J. H.**, Seo, J., Kim, N., Kil, T., Jang, D., Lee, H. K. (2024). A coupled chemo-transport-mechanical damage model for the mineral transformation in cementitious materials under a sulfate-rich environment. *Journal of Building Engineering*, 94, 109971.
9. Kil, T., **Bae, J. H.**, Park, J., Jang, D., Yang, B., Lee, H. K. (2024). A multiscale modeling framework for predicting strain-dependent electrical conductivity of carbon nanotube-incorporated nanocomposites considering the electron tunneling effect. *Polymer Composites*, 45(8), 7551-7563.
10. **Bae, J. H.**, Kil, T., Cho, G., Jang, J. G., Yang, B. (2024). Hierarchical multiscale modeling for predicting the physicochemical characteristics of construction materials: A review. *Computers and Concrete* 33 (3), 325.
11. Seo, J., **Bae, J. H.**, Kim, N., Jang, D., Lee, H. K. (2024). Investigation of leaching behaviors of carbonation-cured CSA cements using an electrically accelerated leaching test. *Construction and Building Materials*, 411, 134278.
12. Kim, S., Kil, T., Shin, S., Jang, D., Yoon, H.N., **Bae, J. H.**, Seo, J., Yang, B. (2023). Flexural behavior of reinforced concrete beams strengthened with an ultra-high performance concrete panel of various thicknesses. *Computers and Concrete* 32 (5), 487.
13. Kim, N., Park, J., Amr, I. T., **Bae, J. H.**, Fadhel, B. A., Cho, A., Tay, S.W., Seo, J. H., Lee, H. K. (2023). Hydration kinetics of ordinary Portland cement mixed under a direct CO₂ inject condition. *Journal of Building Engineering*, 77, 107531.
14. Jang, D., Yoon, H. N., Park, S., Kim, S., **Bae, J. H.**, Kim, N., Kim, G. M., Seo, J. (2023). Pressure-aided fabrication of CNT-incorporated composites made with fly ash or slag-blended Portland cement. *Composite Structures*, 313, 116926.
15. Kil, T., **Bae, J. H.**, Yang, B., Lee, H. K. (2023). Multi-level micromechanics-based homogenization for the prediction of damage behavior of multiscale fiber-reinforced composites. *Composite Structures*, 303, 116332.
16. Seo, J., Kim, H., Kim, S., Park, S., **Bae, J. H.**, Kim, N., Jang, D., Lee, H. K. (2022). Sporosarcina pasteurii-

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- induced hydration and shrinkage properties of Portland cement. *Construction and Building Materials*, 356, 129213.
17. **Bae, J. H.**, Kim, S., Amr, I. T., Seo, J., Jang, D., Bamagain, R., Bandar, A. F., Abu-Aisheh, E., Lee, H. K. (2022). Evaluation of physicochemical properties and environmental impact of environmentally amicable Portland cement/metakaolin bricks exposed to humid or CO₂ curing condition. *Journal of Building Engineering*, 47, 103831.
 18. Lee, D. H., **Bae, J. H.**, Hwang, B. K., Kim, J. H., Kim, S. K., Lee, J. M. (2021). Impact behavior of hollow glass bubble reinforced foam core LNG insulation panel in cryogenic temperature. *Journal of Composite Materials*, 55(15), 1995-2010.
 19. Yoon, H. N., Seo, J., Kim, S., Kil, T., Jang, D., **Bae, J. H.**, Lee, H. K. (2021). Sound-absorption and NO_x-removal performances of TiO₂-incorporated porous concrete made with bottom ash aggregates. *Advances in concrete construction*, 12(1), 1-11.
 20. **Bae, J. H.**, Hwang, B. K., Kim, J. H., Kim, S. K., Lee, J. M. (2020). Cumulative damage of hollow glass microsphere weight fraction in polyurethane foam in response to cryogenic temperatures and repeated impact loading. *Cryogenics*, 107, 103057.
 21. Oh, J. H., **Bae, J. H.**, Kim, J. H., Lee, C. S., Lee, J. M. (2019). Effects of Kevlar pulp on the enhancement of cryogenic mechanical properties of polyurethane foam. *Polymer Testing*, 80, 106093.
 22. Park, K. J., Kim, J. H., Kim, S. K., Heo, H. S., **Bae, J. H.**, Lee, J. M. (2019). Material characteristics of random glass-mat-reinforced thermoplastic under cryogenic thermal cycles. *Science and Engineering of Composite Materials*, 26(1), 270-281.

INTERNATIONAL CONFERENCES

1. Moon, S.Y., **Bae, J. H.**, and Lee, H.K., (2025) "A reactive molecular dynamic simulation of clinker ion dissociation at an early hydration", Engineering Mechanics Institute Conference 2025, Anaheim, USA, May 27-30
2. **Bae, J. H.**, Moon, S.Y., Kil, T.G., and Lee, H.K., (2024) "Recent advancements in atomistic simulations for investigating the interfacial damage mechanisms in graphene-reinforced nanocomposites: Literature review and a preliminary study", 7th International Conference on Materials and Reliability, Busan, South Korea, December 3-6.
3. **Bae, J. H.**, Seo, J.H., Kil, T.G., Kim, N.R., and Lee, H.K., (2023) "Recent advancements in chemo-mechanical modeling on the cementitious materials exposed to harsh environments: An overview", 13th ACerS, New York, USA, June 14-16.
4. Seo, J.H., Kim, S.H., **Bae, J. H.**, and Lee, H.K., (2023) "Characterization of calcium sulfoaluminate cements exposed to accelerated weathering carbonation conditions", 2023 ACI Concrete Convention, San Francisco, USA, April 2-6.
5. Kil, T.G., **Bae, J. H.**, Yang, B.J., and Lee, H.K. (2022) "Micromechanics-integrated artificial neural networks model for the prediction of stress-strain response of carbon nanotube-reinforced nanocomposites", The composites and advanced materials (CAMX) EXPO, Anaheim, California, October 17-20.
6. **Bae, J. H.**, Kil, T.G., Yang, B.J., Tay, S.Y., and Lee, H.K. (2022) "Review on micromechanics-based failure analysis for fiber-reinforced laminates via Puck failure criteria", WCCM-APCOM 2022, Yokohama, Japan, July 31-August 5.
7. Kim, S.H., Yoon, H.N., Seo, J.H., **Bae, J. H.**, and Lee, H.K. (2022) "Recent advancements on binary or ternary binders for chloride resistance improvements: An overview", 11th International Conference on Bridge Maintenance, Safety and Management (IABMAS 2022), Barcelona, Spain, July 11-15.
8. Kil, T.G., **Bae, J. H.**, Yang, B.J., and Lee, H.K. (2021) "Review on experimental and theoretical approaches to characterize the elastic behavior of carbon nanotube-reinforced polymeric nanocomposites", 7th International Conference on Mechanics of Composites (MECHOMP7), Porto, Portugal, September 1-3.

PATENTS

Domestic

1. Lee, H. K., **Bae, J. H.**, Inzimam Ul Haq, "Magnesium oxychloride cement with improved water resistance and its synthesizing method", Oct 7, 2024, Pending, No. 10-2024-013592.
2. Lee, H. K., **Bae, J. H.**, "Concrete curing device for underwater environment", Jan 9, 2024, Pending, No. 10-2024-0029265.

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3. Lee, H. K., **Bae, J. H.**, Kim, S. H. "Cement composite composition for preventing penetration of deteriorating factors for underground city construction, cement composite, and underground building structure", Jan 4, 2023, Pending, No. 10-2023-0013461.
4. Lee, H. K., **Bae, J. H.** "Post-tension equipment applied to an underwater structure", Dec 7, 2022, Pending, No. 10-2022-0169350.
5. Lee, H. K., Seo, J. H., Kim, S. H., **Bae, J. H.** "Magnesium oxychloride cement and method for manufacturing the same", Aug 17, 2022, Registered, No. 10-2435016.
6. Lee, J.M., **Bae, J. H.**, Kim, S. K., Kim, J. H. "Fuel supply system of liquefied hydrogen fuel cell propulsion ship and method for operating the same", Jun 5, 2020, Registered, No. 10-2122023.
7. Lee, J.M., **Bae, J. H.**, Hwang, J. S., Kim, S. K., Kim, J. H. "Cryogenic storage system for storing liquefied hydrogen", Aug 7, 2020, Registered, No. 10-21445180000.
8. Lee, J.M., **Bae, J. H.**, Hwang, H. G., Kim, S. K., Kim, J. H. "System for storing liquefied hydrogen and collecting boil-off hydrogen", Oct 28, Registered, No. 10-2173701.
9. Lee, J. M., **Bae, J. H.**, Hwang, J. S., Kim, H. T., Kim, S. K., Kim, J. H. "Insulation system of liquefied hydrogen cargo containment system and method for manufacturing the same", Nov. 12, 2020, Registered, No. 10-2180562.
10. Lee, J.M., **Bae, J. H.**, Kim, S. K., Kim, J. H. "Full storage system for hydrogen propulsion container ship)", Aug 18, 2020, No. 10-2147544.