Jongrok Kim, Ph. D.

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EDUCATION

- POSTECH (Pohang University of Science and Technology), Korea 2005-2010

  Ph.D. in Mechanical Engineering

  Thesis: A study on characteristics of water behavior in Gas Diffusion Layer of PEMFC

  Advisor: Prof. Moo Hwan Kim

- POSTECH (Pohang University of Science and Technology), Korea 2003-2005

  M.S. in Mechanical Engineering, February 2005

  Thesis: The measurement of void fraction and slug velocity with two three-ring-type conductance meters

  Advisor: Prof. Moo Hwan Kim

- Hanyang University, Korea 1999-2003

  B.S. in Mechanical Engineering, February 2003

RESEARCH EXPERIENCE

- North Carolina State University, US

  Visiting Researcher 2023.7 - present

  - Machine Learning for thermal hydraulic integrated effect tests (ATLAS) and separated effect tests (ATHER)

- Korea Atomic Energy Research Institute, Korea

  Researcher 2012.1 - present

  - ATLAS (Integrated effect test facility at KAERI) operating and analysis for thermal hydraulic safety
  - Separated effect test for thermal hydraulics in core bundle of nuclear power plant
  - Thermo-mechanics and thermal hydraulics coupled experiments for core of nuclear power plant
  - Analysis using safety analysis codes (MARS-KS, RELAP5, DRACCAR)

- University of Cincinnati, US

  Research Assistant 2010.3-2011.12

  - Water transport through porous medium

    : Designed and constructed the experimental setup to measure the water transport through micro porous medium (Gas diffusion layers of fuel cell)

  - Molecular dynamics simulation (program : LAMMPS)

    : Condensation on surface of nano particles

- POSTECH (Pohang University of Science and Technology), Korea

  Graduate Research Assistant 2003- 2010

  - 2D and 3D Visualization of water distribution in micro porous medium using X-ray Radiography (at Pohang synchrotron research institute, Korea) and Neutron Radiography (at Korea Atomic Energy Research Institute).
  - Programming for image processing of Radiography images using Visual basic, Image-Pro, and IDL.
  - Analyze the water behavior in micro porous medium.
  - Designed and constructed the experimental setup for measurement of the break-through pressure to analyze the characteristics of GDL
  - Investigation and development of electromagnetic flow meter and conductance meter

: Designed, fabricated, and tested a conductance meter to measure the void fraction and bubble velocity of liquid-gas two-phase flow.

- Tested and analyzed the electromagnetic flow meter for liquid-gas two phase flow

JOURNAL PUBLICATIONS (International)

1. Young Seok Bang, Deog Yeon Oh, Joosuk Lee, **Jongrok Kim**, Sang-Ki Moon, "Prediction of reflood behavior in a bundle with deformed and un-deformed rods in ATHER 5 × 5 experiment using MARS-KS code", Nuclear Engineering and Design, 392, 111770, 2022
2. **Jongrok Kim**, Byoung-Uhn Bae, Yusun Park, Jae Bong Lee , Nam-Hyun Choi, Seok Cho and Kyoung-Ho Kang, "Comparison of Blind and Open Calculation Results for Top-Slot Break LOCA in Fourth ATLAS Domestic Standard Problem", Energies, 15, 3189, 2022
3. Byoung-Uhn Bae, Jae Bong Lee, Yu-Sun Park, **Jongrok Kim**, Kyoung-Ho Kang, "Experimental investigation on thermal hydraulic interaction of RCS (reactor coolant system) and containment for intermediate break loss-of-coolant accident (IBLOCA) scenario in ATLAS-CUBE test facility", Progress in Nuclear Energy, 146, 104156, 2022
4. Byoung-Uhn Bae, Jae-Bong Lee, Yu-Sun Park, **Jong-Rok Kim**, Seok Cho, Kyoung-Ho Kang, "Integral effect test and MARS-KS calculation with uncertainty propagation analysis for direct vessel injection line break intermediate-break loss-of-coolant accident", Nuclear technology, 207, 680, 2021
5. Byoung-Uhn Bae, Jae Bong Lee, Yu-Sun Park, **Jongrok Kim**, Kyoung-Ho Kang, "Integral Effect Test for Steam Line Break with Coupling Reactor Coolant System and Containment Using ATLAS-CUBE Facility", Nuclear Engineering and Technology, 53, 2477, 2021
6. Kyoung-Ho Kang, Byoung-Uhn Bae, **Jong-Rok Kim**, Yu-Sun Park, Jae-Bong Lee, Seok Cho, Nam-Hyun Choi, Ki-Yong Choi "Integral effect test results on the effect of asymmetric supply of feedwater during a station blackout transient of pressurized water reactor", Annals of Nuclear Energy, 149, 107837, 2020
7. **Jongrok Kim**, Byoung-Uhn Bae, Jae Bong Lee, Yusun Park, Seok Cho and Kyoung-Ho Kang, "Integral Effect Test on Top-Slot Break Scenario With 4 Inches Cold Leg Break LOCA in ATLAS Facility", Frontiers in Energy Research, 8, 57, 2020
8. Yusun Park, Byoung-Uhn Bae , **Jong-Rok Kim**, Seok Cho , Kyoung-Ho Kang , Ki-Yong Choi, "Counterpart Test for LSTF 1% Cold-leg Break LOCA (SB-CL-32) Utilizing ATLAS Test Facility", Nuclear Engineering and Design, 370, 110912, 2020
9. Byoung-Uhn Bae, Yu-Sun Park, **Jong-Rok Kim**, Kyoung-Ho Kang, Ki-Yong Choi, "Integral Effect Test on Station Blackout (SBO) Scenario with Steam Generator Tube Rupture (SGTR) in ATLAS Facility", Nuclear Engineering and Design, 328, 107, 2018
10. Seung-Hyun Hong, Sarah Kang, **Jongrok Kim**, Jong-Kuk Park, Sang-Ki Moon, "Reflood Experiments at Elevated Pressures using Intact and Deformed Rod Bundles to Simulate Small and Medium Break Loss-of-Coolant Accidents", Nuclear Engineering and Design, 338, 209, 2018
11. **Jongrok Kim**, Seok Cho, Jong-Kuk Park, Young-Jung Youn, Sang-Ki Moon, "Experimental study to assess effects of ballooning and fuel relocation on the coolability of fuel rod bundle", Nuclear Engineering and Design, 332, 1, 2018
12. Kyoung-Ho Kang, Yu-sun Park, Byoung-Uhn Bae, **Jong-Rok Kim**, Nam-Hyun Choi and Ki-Yong Choi, "Code assessment of ATLAS integral effect test simulating main steam-line break

accident of an advanced pressurized water reactor", Journal Of Nuclear Science and Technology, 1383212, 2017

13. Ngoc Hung Nguyen, **Jongrok Kim**, Seung-Hyun Hong, Sang-Ki Moon, Chul-Hwa Song, "Improvements of COBRA-TF on the effect of flow blockage during a LB LOCA with consideration of fuel relocation phenomenon", Nuclear Engineering and Design, 325, 218, 2017
14. Hansol Kim, Jae Young Lee, **Jongrok Kim**, Dong-Jin Euh, "Visualization of droplet entrainment generated from interactions between falling film flow and lateral air flow", Journal of flow visualization and image processing, 325, 218, 2017
15. Kyu Byung Lee, **Jong Rok Kim**, Goon Cherl Park and Hyoung Kyu Cho, "Feasibility Test of a Liquid Film Thickness Sensor on a Flexible Printed Circuit Board Using a Three-Electrode Conductance Method", Sensors, 17, 42, 2017
16. Byoung Jae Kim, **Jongrok Kim**, Kihwan Kim, Sung Won Bae, Sang-Ki Moon, "Effects of fuel relocation on reflood in a partially-blocked rod bundle", Nuclear Engineering and Design, 312, 239, 2017
17. Sang-Ki Moon, **Jongrok Kim**, Kihwan Kim, Byoung Jae Kim, Jong Kuk Park, Young-Jung Youn, Hae Seob Choi, and Chul-Hwa Song "Reflood experiments in rod bundles with flow blockages due to clad ballooning", Kerntechnik, 81(3), 251, 2016
18. Kyoung-Ho Kang, Byoung-Uhn Bae, **Jong-Rok Kim**, Yu-Sun Park, Seung-Wook Lee, Chul-Hwa Song, Ki-Yong Choi, "Development of a Phenomena Identification Ranking Table for Simulating a Station Blackout Transient of a Pressurized Water Reactor with a Thermal-hydraulic Integral Effect Test Facility", Annals of nuclear energy, 75, 72, 2015
19. Sang-Ki Moon, **Jongrok Kim**, Seok Cho, Byoung Jae Kim, Jong Kuk Park, Young-Jung Youn and Chul-Hwa Song, "Single-phase convective heat transfer enhancement by spacer grids in a rod bundle", Journal of Nuclear Science and Technology, 51(4), 543, 2014
20. Junho Je, Seungwoo Doh, **Jongrok Kim**, and Moo Hwan Kim "Heterogeneous Porosity Distribution Under Compression of Gas Diffusion Layer Using Synchrotron X-ray Tomograph", ECS Transactions, 50(2), 369, 2013
21. **Jongrok Kim**, Junho Je, TaeJoo Kim, Massoud Kaviany, Sang Young Son, MooHwan Kim, "Breakthrough/drainage pressures and X-ray water visualization in gas diffusion layer of PEMFC", Current Applied Physics, 12, 105, 2012
22. **Jongrok Kim**, Junho Je, Massoud Kaviany, Sang Young Son, MooHwan Kim, "Fuel crossover and internal current in polymer electrolyte membrane fuel cell from water visualization using X-ray Radiography", Journal of Power source, 196(20), 8398, 2011
23. Junho Je, **Jongrok Kim**, Massoud Kaviany, Sang Young Son, MooHwan Kim, "X-Ray Tomography of Freeze/Thaw Morphological Changes in Gas Diffusion Layers", Journal of Synchrotron Radiation, 18, 743, 2011
24. **Jongrok Kim**, Yeh-Chan Ahn and Moo Hwan Kim, "Measurement of void fraction and bubble speed of slug flow with three-ring conductance probes", Flow Measurement and Instrumentation, 20(3), 103, 2009
25. TaeJoo Kim, **JongRok Kim**, CheulMuu Sim, SeungWook Lee, Massound Kaviany, SangYoung Son and MooHwan Kim, "Experimental approaches for distribution and behavior of water in PEMFC under flow direction and differential pressure using neutron imaging technique", Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 600(1), 325, 2009

26. TaeJoo Kim, **JongRok Kim**, CheulMuu Sim, Sungho Lee, Youngin Son, and MooHwan Kim, "Experimental approaches for water discharge characteristics in PEMFC using neutron imaging technique at CONRAD, HMI, Nuclear Engineering and Technology", Nuclear Engineering and Technology, 41(1), 2009

REPORT FOR INTERNATIONAL PROJECT

1. Jongrok Kim, Kyoung-Ho Kang, Byoung-Uhn Bae, Yusun Park, Andong Shin, Minki Cho, "Evaluation for 4-Inch Cold Leg Top-Slot Break LOCA in ATLAS Facility with RELAP5 Mod3.3 Patch5", NUREG/IA-0523, US NRC, 2021

PROJECTS

2. OECD/NEA ATLAS international joint project (3rd phase), 2021.01.01.- present (2024.12.31.), OECD/NEA
3. OECD/NEA ATLAS international joint project (2nd phase), 2017.10.01.-2020.12.31. OECD/NEA
4. OECD/NEA ATLAS international joint project (1st phase), 2014.04.01.-2017.03.31. OECD/NEA
5. Validation of core safety issues in response to strengthening technical criteria and development of technology to improve core safety in multiple failure accidents, 2022.06.01. - present (2029.12.3.), Ministry of Science and ICT.
6. Development of a real-time detection system for unidentified RCS leakage less than 0.5gpm, 2018.05.01.- present (2023.04.30.) Korea Atomic Energy Research Institute.
7. Multi-dimensional Flow Analysis for Reactor Rod Bundle and Multi-Physics Coupled Safety Assessment for Accident Conditions, 2017.03.01.-2021.12.31. Ministry of Science, ICT and Future Planning.
8. Reactor Coolant System and Reactor Containment Integrated Thermal-Hydraulic Integral Effect Test for Safety Evaluation and Enhancement of LWR, 2017.03.01.-2021.12.31. Ministry of Science, ICT and Future Planning.
9. Joint Research Laboratory Program for Advancement of Nuclear Thermal-Hydraulics Safety, 2016.9.1-2019.8.31. Korea Research Council of Fundamental Science & Technology
10. Verification Tests for Technology Development of SG Accident and Transient Analysis, 2013.11.01.-2014.10.31., Doosan Heavy Industry.
11. Development of software package for the coupling of multi-physics simulation codes and validation of multi-dimensional core TH simulation, 2012.12.06-2013.11.30. Ministry of Science, ICT and Future Planning.
12. Safety Assessment and Model Improvement of Emergency Core Cooling, 2012.03.01.-2017.02.28. Ministry of Science, ICT and Future Planning.
13. Thermal-Hydraulic Integral Effect Tests for Best-Estimate Evaluation of Emergency Core Cooling of PWRs, 2012.03.01.-2017.02.28. Ministry of Science, ICT and Future Planning.

14. The development of technique for real-time measurement of coolant and produced water in metal bipolar plate using neutron radiography, 2008.12.1-2010.2.28, Hyundai motors
15. Research on fuel cell performance enhancement, 2006.12.1-2011.09.30., Korea Foundation for International Cooperation of Science and Technology • Korea Ministry of Education, Science and Technology
16. Evaluation and proposal of improvement for the measurement system in ATLAS, 2005.3.1-2007.2.28, Korea Atomic Energy Research Institute
17. The Development of Neutron Radiography Technique for 2-Phase Flow and Water Distribution Visualization inside Fuel Cell, 2004.12.1-2009.6.30, NGC (Hyundai motors group)
18. Development of high efficiency technologies for the components of hydrogen applied energy system, 2004.9.1-2005.8.31, Korea Industrial Technology Foundation
19. A Real-time Simultaneous Measurement of the Gas and Liquid Velocity Using Electromagnetic Flowmeter, 2003.3.1-2005.2.28, Korea Atomic Energy Research Institute
20. Development of analytical method and verification technique for two phase flow and phase change heat transfer, 2003.3.1-2004.8.31, Korea Ministry of Science and Technology

PATENTS (Korean)

1. MEASURING METHOD OF BREAK-THROUGT PRESSURE FOR GAS DIFFUSION LAYER, 10-13012260000
2. MEASEREMENT DEVICE FOR DEFORMATION OF RED BLOOD CELL, 10-13081160000
3. FLUID VOLUME MEASUREMENT METHOD USING X-ray RADIOGRAPHY, 10-12875480000
4. MEASUREMENT APPARATUS AND METHOD FOR LIQUID THICKNESS USING REFRACTION, 10-1542017
5. HOT WIRE MESH ANEMOMETER, 10-1543967
6. HOT WIRE MESH ANEMOMETER FOR MEASURING TWO-PHASE FLUID, 10-1543968
7. SPENT NUCLEAR FUEL COOLING APPARATUS, 10-1796152
8. SPENT NUCLEAR FUEL COOLING APPARATUS AND CONTROL METHOD FOR THE SAME, 10-1796151
9. MEASUREMENT APPARATUS AND METHOD FOR LIQUID THICKNESS, 10-1856562
10. SIMULATION APPARATUS FOR PARTIAL CLOGGING OF NUCLEAR REACTOR CORE, 10-1872700
11. SUBSTRATE FOR MEASURING LIQUID THICKNESS, APPARATUS FOR THE SAME, AND METHOD FOR THE SAME, 10-1879271
12. APPARTUS AND METHORD FOR DETETING CRACK BY MICROPATICLE DETECTION, 10-1960299
13. FUEL ROD DEFORMATION MEASURING APPARATUS, 10-2067502
14. DEPRESSURIZING METHOD FOR HIGH PRESSURE SEALED SYSTEM, 10-2100644