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Engineering & Scientific Consulting

Artyom Kossolapov, Ph.D.

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Professional Profile

Dr. Kossolapov has expertise in heat transfer, fluid mechanics, multiphase flow, and thermal hydraulics of nuclear reactors. He specializes in experimental and analytical investigations of complex heat transfer and fluid mechanics problems, including the performance of two-phase thermal management systems, lithium-ion battery failures, boiling heat transfer, radiative heat transfer and infrared thermometry. Prior to joining Exponent, Dr. Kossolapov was a researcher at MIT where he designed and built a unique experimental apparatus that allowed a direct visualization and quantification of the boiling process at the high pressures and temperatures typical of nuclear reactors. He also developed an improved measurement technique that allowed simultaneous quantification of micro- and mesoscale boiling features. Dr. Kossolapov developed image processing algorithms for extracting quantitative information from high-speed video and infrared images of the boiling process.

Dr. Kossolapov has experience with nano- and microfabrication techniques (PVD sputtering and evaporators), phase-change heat transfer in microgravity, 3D printing (Stereolithography (SLA) and Fused Deposition Modeling (FDM)), SolidWorks CAD, and computational fluid mechanics (STAR-CCM+).

Academic Credentials & Professional Honors

Ph.D., Nuclear Science and Engineering, Massachusetts Institute of Technology (MIT), 2021

M.S., Nuclear Science and Engineering, Massachusetts Institute of Technology (MIT), 2018

B.Eng., Nuclear Engineering, Peter the Great St. Petersburg Poly Univ, 2015

Professional Affiliations

American Nuclear Society (ANS)

Publications

Papers in Peer-Reviewed Journals:

P. Di Marco, A.I. Garivalis, G. Manfredini, G. Saccone, A. Kossolapov, M. Bucci, "Critical heat flux enhancement in microgravity conditions coupling microstructured surfaces and electrostatic field", npj Microgravity, accepted

M. Ravichandran, G. Su, C. Wang, J.H. Seong, A. Kossolapov, B. Phillips, Md M. Rahman, M. Bucci, "Decrypting the boiling crisis through data-driven exploration of high-resolution infrared thermometry measurements", Applied Physics Letters, Vol. 118, 253903, 2021

R.Nop, M.-C. Duluc, N.Dorville, A. Kossolapov, F.Chavagnat, M.Bucci, "An energy model for the transient flow boiling crisis under highly subcooled conditions at atmospheric pressure", International Journal of Thermal Sciences, Vol. 168, 107042, 2021

A. Kossolapov, B.Phillips, M.Bucci, "Can LED lights replace lasers for detailed investigations of boiling phenomena?", International Journal of Multiphase Flow, Vol. 135, 103522, 2021

A. Kossolapov, F. Chavagnat, R. Nop, N. Dorville, B. Phillips, J. Buongiorno, M. Bucci, "The boiling crisis of water under exponentially escalating heat inputs in subcooled flow boiling at atmospheric pressure", International Journal of Heat and Mass Transfer, Vol. 160, 120137, 2020

Andrew Richenderfer, Artyom Kossolapov, Jee Hyun Seong, Giacomo Saccone, Etienne Demarly, Ravikishore Kommajosyula, Emilio Baglietto, Jacopo Buongiorno, Matteo Bucci, "Investigation of subcooled flow boiling and CHF using high-resolution diagnostics", Experimental Thermal and Fluid Science, Vol. 99, pp 35-58, 2018

Proceedings in Peer-Reviewed Conferences (Full Papers):

A. Kossolapov, B. Phillips, M. Bucci, "Experimental Investigation of Bubble Dynamics in Subcooled Flow Boiling of Water at Prototypical Pressure of Boiling Water Reactors," CFD4NRS-8: Computational Fluid Dynamics for Nuclear Reactor Safety - OECD/NEA Workshop, (virtual meeting), November 25-27, 2020

A. Kossolapov, B. Phillips, M. Bucci, "Experimental investigation of subcooled flow boiling and CHF at high pressure using high-resolution diagnostics," 18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-18), Portland, Oregon, USA, August 18-23, 2019

G. Su, C. Wang, J. H. Seong, A. Kossolapov, B. Phillips, M. Bucci, "Infrared study of flow boiling and CHF on prototypical surfaces with nuclear fuel cladding morphology," 18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-18), Portland, Oregon, USA, August 18-23, 2019

M. Abir, B. Khaykovich, J. Petrik, A. Kossolapov, B. Phillips, M. Bucci, "Measurements of boiling heat transfer, time-averaged void fraction distributions using neutron radiography," 18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-18), Portland, Oregon, USA, August 18-23, 2019

A. Richenderfer, A. Kossolapov, T. McKrell, M. Bucci, J. Buongiorno, "The application of Modern Experimental Techniques to the Study of Subcooled Flow Boiling CHF", 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17), Xi'an, China, September 3 - 8, 2017

A. Kossolapov, L. Fan, M. Bucci, T. McKrell, J. Buongiorno, "Measurement of the Apparent Contact Angle of Water on Reactor Materials at Elevated Pressures and Temperatures", 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17), Xi'an, China, September 3 - 8, 2017

A. Kossolapov, G. Su, T. McKrell, M. Bucci, J. Buongiorno, "Transient Flow Boiling and CHF under Exponentially Escalating Heat Inputs", 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17), Xi'an, China, September 3 - 8, 2017

A. Richenderfer, A. Kossolapov, J. H. Seong, G. Saccone, T. McKrell, M. Bucci, J. Buongiorno, "Direct Measurement of Heat Flux Partitioning in Boiling Heat Transfer", ASME 2017 Fluids Engineering Division Summer Meeting (FEDSM), Waikoloa, Hawaii, 2017

A. Richenderfer, A. Kossolapov, J. H. Seong, T. McKrell, M. Bucci, J. Buongiorno, "Investigation of Subcooled Flow Boiling and CHF Using High-Resolution Diagnostics", 9th World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Iguazu Falls, Brazil, 12-15 June, 2017

A. Kossolapov, T. McKrell, M. Bucci, J. Buongiorno, "Transient Flow Boiling CHF under Exponentially Escalating Heat Input", 9th World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Iguazu Falls, Brazil, 12-15 June, 2017

A. Mityakov, V. Mityakov, S. Sapozhnikov, A. Kossolapov, D. Markovich, "Simultaneous Particle Image Velocimetry and Gradient Heat Flux Measurement", International Conference on Mechanics - 7th Polyakhov's reading, St.Petersburg, Russia, 2015. Publisher: IEEE

A.A. Gusakov, A. Kossolapov, D.M. Markovich, A.V. Mityakov, V.Y. Mityakov, S.A. Mozhayskiy, A.S. Nebuchinov, S.Z. Sapozhnikov, "Simultaneous PIV and Gradient Heat Flux Measurement of a Circular Cylinder in Cross-Flow", Applied Mechanics and Materials Vol. 629 pp 444-449, 2014

Presentations

A. Kossolapov, B. Phillips, M. Bucci, "Experimental Investigation of Bubble Dynamics in Subcooled Flow Boiling of Water at Prototypical Pressure of Boling Water Reactors," oral presentation, CFD4NRS-8: Computational Fluid Dynamics for Nuclear Reactor Safety - OECD/NEA Workshop, (virtual meeting), November 25-27, 2020

A. Kossolapov, B. Phillips, M. Bucci, "What would boiling look like inside a nuclear reactor?", oral presentation, 2020 ANS Virtual Winter Meeting, (virtual meeting), November 16 - 19, 2020

A. Kossolapov, B. Phillips, M. Bucci, "Experimental investigation of subcooled flow boiling and CHF at high pressure using high-resolution diagnostics," oral presentation, 18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-18), Portland, Oregon, USA, August 18-23, 2019

M. Abir, B. Khaykovich, J. Petrik, A. Kossolapov, B. Phillips, M. Bucci, "Measurements of boiling heat transfer, time-averaged void fraction distributions using neutron radiography," oral presentation, 18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-18), Portland, Oregon, USA, August 18-23, 2019

A. Richenderfer, A. Kossolapov, T. McKrell, M. Bucci, J. Buongiorno, "The application of Modern Experimental Techniques to the Study of Subcooled Flow Boiling CHF", oral presentation, 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17), Xi'an, China, September 3 - 8, 2017

A. Kossolapov, L. Fan, M. Bucci, T. McKrell, J. Buongiorno, "Measurement of the Apparent Contact Angle of Water on Reactor Materials at Elevated Pressures and Temperatures", oral presentation, 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17), Xi'an, China, September 3 - 8, 2017

A. Kossolapov, G. Su, T. McKrell, M. Bucci, J. Buongiorno, "Transient Flow Boiling and CHF under Exponentially Escalating Heat Inputs", oral presentation, 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17), Xi'an, China, September 3 - 8, 2017

A. Kossolapov, T. McKrell, M. Bucci, J. Buongiorno, "Transient Flow Boiling CHF under Exponentially Escalating Heat Input", oral presentation 9th World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Iguazu Falls, Brazil, 12-15 June, 2017

A. Kossolapov, A. Richenderfer, M. Bucci, T. McKrell, J. Buongiorno, "New Diagnostics and Post-Processing Techniques Capture Subcooled Flow Boiling CHF", oral presentation, 14th Multiphase Flow Conference & Short Course, Dresden, Germany, 08 - 10 November 2016

A. Kossolapov, A. Richenderfer, M. Bucci, T. McKrell, J. Buongiorno, "New Diagnostics and Post-Processing Techniques Capture Subcooled Flow Boiling CHF", poster presentation, Computational Fluid

Dynamics for Nuclear Reactor Safety Applications-6 (CFD4NRS-6), Cambridge, USA, 13-15 September 2016

Additional Education & Training

Kaufman Teaching Certificate Program – a course offered by MIT that provides an extensive training aimed at the development of effective teaching skills

Peer Reviews

Applied Thermal Engineering

Measurement