

**Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska,  
Departament Układów Złożonych,  
Narodowe Centrum Badań Jądrowych**

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Park Naukowo-Technologiczny, Otwock-Świerk

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**Impact of Recent Advancements in Multiphase Science on  
Nuclear Reactor Thermal-Hydraulics and Safety Studies**

Abstrakt:

The recent progress in multiphase science and technology has made a considerable impact on nuclear reactor thermal-hydraulics. However, the needs for obtaining solutions to a variety of practical questions have had both pros and cons. The former have been reflected in the role of needs as an obvious research stimulation factor, the latter have been due to fact that the urgency of producing results often limited systematic investigations of the underlying physics.

The objective of this presentation is to give an overview of selected issues illustrating the current state of knowledge in regard to various aspects of multiphase physics and its application to reactor thermal-hydraulics, including: theoretical fundamentals of multiphase fluid mechanics and heat transfer, formulation and limitations of closure laws (models vs. correlations), importance of proper understanding of the experimental and modelling uncertainties, validation vs. tuning, scaling principles and limitations, and challenges associated with next generation reactors.

Examples will be shown illustrating applications varying from micro-scale phenomena, at or below the individual bubble level, to macroscale, such as the physico-chemistry of core meltdown phenomena.

<sup>[1]</sup>**Biography:** Dr. Podowski is Professor of Nuclear Engineering and Engineering Physics in the Department of Mechanical, Aerospace and Nuclear Engineering at Rensselaer Polytechnic Institute, and Director of Center for Multiphase Research. His research interests include fundamentals and applications of multiphase flow and heat transfer, computational multiphase flow dynamics (CMFD), supercritical-pressure turbomachinery and systems, dynamics and stability of multiphase systems and nuclear reactor thermal-hydraulics and safety. Professor Podowski has over 350 technical publications, including 7 books/book-chapters and 60+ journal papers. He is Fellow of American Nuclear Society (ANS) and recipient of the 2014 ANS Compton Award.