

Foreword

Selected papers from the 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17)

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Thermal hydraulics has continued to be one of the most critical and challenging subjects in the field of nuclear engineering. Several issues of concern include improved understanding of fundamental physical phenomena, various thermal-hydraulic limits, and applications to existing and future advanced reactors. The understanding of such complex multiscale, multidimensional, and multiphase flows is limited. These challenges in reactor thermal hydraulics continue to draw major interest from academic and industry researchers. Various investigations in advanced simulation, modeling, and measurement techniques have been carried out to enhance our understanding of thermal-hydraulic phenomena under complex geometry and broad spectra of operating conditions.

In this special issue of *Nuclear Science and Engineering*, 14 articles were selected from a large pool of quality papers that were submitted to the 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17), which took place September 3–8, 2017, in Xi'an, China. In addition to this special issue, two more special issues are being published, in *Nuclear Technology* and *Nuclear Engineering and Design*, for other papers selected from the NURETH-17 proceedings.

NURETH-17 succeeds a prosperous line of international meetings for nuclear reactor expertise and thermal hydraulics insight, dating back to 1980 in Saratoga Springs, New York, with its 108 papers in 14 technical sessions and 14 keynote and “state of the art” addresses. It is one of the leading and most outsized platforms for international interested parties to

foster and deliberate ideas and critical information. It is a very effective vehicle to initiate prospective collaborations in the areas of fluid flow, heat transfer, boiling and multiphase phenomena, reactor thermal hydraulics, and safety assessment of nuclear systems. The NURETH series has been known as a key forum for younger generations of researchers to seek mentors and sponsorship and for the entire nuclear community to enhance cross-fertilization of research and applications.

With the lessons derived from the 2011 Fukushima Daiichi nuclear accidents, the nuclear energy community has devoted paramount attention to research and efforts leading to enhancement of nuclear safety and continued reliable operation of nuclear power plants. The community itself recognizes that nuclear reactor thermal hydraulics is the key to ensuring and supporting the overall safe and efficient operation of nuclear power plants and that it is essential that professional forums, such as NURETH, continue to facilitate communication of present and potential future research topics and to provide a powerful setting for the exchange of such global technologies.

In 2017, about one thousand thermal hydraulics experts from around the world (over 70% from overseas) traveled to Xi'an, China, to attend NURETH-17, sponsored by the American Nuclear Society (ANS) and the Chinese Nuclear Society (CNS). NURETH-17 was also cosponsored by Xi'an Jiaotong University and a number of international nuclear professional societies as well as the local organizing committee led by the Shaanxi Nuclear Society. A total of 1020

abstracts were submitted, over 890 draft papers were reviewed, and finally, a grand total of over 780 full papers from 35 countries were accepted and presented in 124 technical sessions as either oral (689) or poster presentations. In addition, 22 invited keynote lectures (15) and plenary speeches (7) addressed the state-of-the-art challenges in various areas of thermal hydraulics at NURETH-17.

With the vast amount of information presented and exchanged, one of the NURETH-17 technical program committee's (TPC's) critical tasks was to revisit all of the presented papers and evaluate the comments and recommendations from the reviewers, session chairs, and best paper selection committees. The TPC and guest editors then coordinated efforts to select a limited number of NURETH-17 papers and invited keynote and plenary lectures to be considered for archival publication in leading scientific journals of nuclear science and engineering to share highlights of focused subjects that were presented, discussed, and challenged at NURETH-17. The authors were then invited to update their papers before submitting them for additional peer review for these journal special issues.

The papers in this special issue cover research activities pertaining to the broad field of nuclear reactor thermal

hydraulics, including high-fidelity bubble tracking and computational fluid dynamics modeling of boiling phenomena; validation, uncertainty quantification, and uncertainty analysis; experimental study and measurements; countercurrent flow limit and reactor thermal hydraulics under ocean conditions; and heat transfer enhancement. These topics will continue to draw the attention of industry and academia worldwide for ongoing and future research activities.

In assembling this special issue of *Nuclear Science and Engineering*, one of the most comprehensive compilations in nuclear reactor thermal hydraulics today, sincere gratitude is expressed to all the authors and reviewers for their time and efforts toward this special issue. Wholehearted appreciation is also owed to the members of the organizing committee, the sponsors, the session chairs, the track leaders, the TPC members, and to all who participated in contributing, reviewing, and organizing NURETH-17. Many thanks to Professor Michael Corradini, associate editor of *Nuclear Science and Engineering*, for his invaluable support and contribution in this production process. Additionally, special appreciation to David Strutz, production editor at ANS, for his timely assistance and devoted efforts to this special issue.