Chunsheng Zhao and Ying Yang*

Editorial

DOI 10.1515/ehs-2015-0016

The 11th International Workshop on Piezoelectric Materials and Applications (IWPMA) and the 9th Energy Harvesting Workshop (EHW) was held in Suzhou, Jiangsu, China on September 22–25, 2014. This IWPMA meeting built upon the previously held successful workshop across three different continents – Asia, Europe and North America. The workshop started in 2004 as a Korean and German bilateral meeting and has over the years grown to become an internationally recognized annual meeting. The EHW was initiated in 2006 and has been organized annually by committee comprising of scientists and engineers active in energy harvesting research. This was the 9th anniversary of the EHW (www.ehworkshop.com). Last year's EHW was held outside the United States in Hannover, Germany. We are thankful to both honorary committees of IWPMA and EHW for giving us – Nanjing University of Aeronautics and Astronautics and Soochow University – the chance to host this joint event.

The workshops were well attended, with more than 160 participants from several countries. The technical program of the workshops extended to three days, including 84 oral presentations and 64 poster presentations. These successful workshops provided excellent exchange of ideas, technical innovation and new developments in the field of piezoelectric materials and their applications in actuators and energy harvesting. The workshops further provided opportunity to develop new collaborations and partnerships to initiate programs or expedite the progress on ongoing research program.

We would like to thank the general IWPMA committee members and energy harvesting workshop committee members, whom provided the support in developing the workshop agenda, selection of the plenary speakers, encouraging participation and contributing in execution of the meeting. Without their enthusiastic support, the workshops would be impossible. We would also specially like to thank the plenary speakers for their support towards this workshop: Prof. Sang-Gook Kim, Dr. Mickaël. Lallart, Dr. Xiaoqi Bao, Dr. Jun Akedo, Dr. Prof. Shashank Priya, Prof. Marian Wiercigroch, Prof. Ray H. Baughman, Prof. Lining Sun, Prof. Haosu Luo, Prof. Kazushi Yamanaka, Prof. Sahn Nahm, Dr. Chuxin Zhou, and Prof. Wanlin Guo. During the three-day workshops, all the participants had the opportunity to conduct fruitful discussions, report interesting findings, and stimulate new promising ideas. We thank all the participants in providing the technical support to the workshop which was critical towards the success.

The conference proceeding CDROM disk containing information on both oral and poster papers presented at the workshop was distributed to all the participants. Some of the accepted papers are being published as special issue in Energy Harvesting and Systems. Others will be published in Transactions of Nanjing University of Aeronautics & Astronautics and Journal of Transactions of Nonferrous Metals Society of China. All papers were carefully reviewed according to the instructions provided by the respective journals. Because of the time and page limitations, only small fraction of the submitted papers were accepted for publication.

This special issue in Energy Harvesting and Systems includes sixteen papers covering the topical areas of piezoelectric, multiferroic and dielectric materials, functional components, composites, processing techniques, thin film deposition methods, piezoelectric actuator and transducer designs, optimization and application of functional materials, and energy harvester modeling and validation. Zhang et al. have studied the lead-free 0.96 $(Bi_{0.5}Na_{0.5})TiO_3$–$(0.04-x)BaTiO_3$–$xLiNbO_3$ ceramic systems. The morphotropic phase boundary in this ceramic system was confirmed at $x = 0.03$. High piezoelectric performance was observed in the vicinity of the boundary. Wen et al. performed the optimization of a piezoelectric linear actuator using parametric optimum method based finite element method (FEM). The results show that the displacement on the top surface is increased by 23.3% compared with the unoptimized configuration. Epitaxial multiferroic $(1-x)BiFeO_3$–$xYMnO_3$ films were grown on $(001)SrTiO_3$ substrates by Nie et al. exhibiting reduced lattice parameters and upward self-poling on $La_{0.67}Sr_{0.33}MnO_3$ buffer layers. Borodinas et al. introduced ultrasonic cavitation to process the algae cells for oil extraction. The system is meant to be more efficient

***Corresponding author: Ying Yang,** State Key Laboratory of Mechanics and Control of Mechanical Structures, Nanjing University of Aeronautics and Astronautics, PO Box 359, 29 Yudao Street, A18-908, Nanjing, Jiangsu 210016, China, E-mail: yingyang@nuaa.edu.cn
Chunsheng Zhao, State Key Laboratory of Mechanics and Control of Mechanical Structures, Nanjing University of Aeronautics and Astronautics, PO Box 359, 29 Yudao Street, 9-501, Nanjing, Jiangsu 210016, China, E-mail: cszhao@nuaa.edu.cn

compared with its analogues. Gu et al. fabricated 1–3 connectivity piezoelectric ceramic-polymer composites that demonstrated low acoustic impedance and high thickness coupling coefficient. Fan et al. fabricated dense PZT-PMS-PZN ceramics by adding 1% CuO as sintering agent and used it for multilayer structures and then multilayer actuator with 60 active piezoelectric layers demonstrated a displacement of 2.7 μm at 80 V voltage. Saalbach et al. made custom lithium niobate transducers for detecting material distribution of hybrid workpieces. Hu et al. designed and characterized a large displacement electro-thermal actuator for a new kind of safety-and-arming device. Zheng et al. investigated the effects of ultrasonic motors stator teeth height on reliability. Burns et al. investigated the influence of non-axial process loads on the transducer and the associated mounting in ultrasonic machining. Hofmann et al. optimized a piezoelectric bending actuator for a tactile virtual reality display. Mažeika et al. designed and investigated a piezoelectric actuator based on two bending-type langevin transducers. Ille et al. introduced the process emulation system for high power piezoelectric ultrasonic actuators. Enhanced magnetization is obtained in $YMnO_3$ doped $BiFeO_3$ epitaxial films. Ren et al. grew xPb(Ni,Nb)O_3–(1–x)PZT(50/50) (PNN-PZT) film on $Pt/TiO_2/SiO_2/Si$ substrates and high remanent polarization of pr = 99 $\mu c/cm^2$ are observed from 0.05PNN to 0.95PZT near MPB composition. Yao et al. investigated the effect of A-site ion excess on (K, Na)NbO_3 thin film fabricated by sol-gel non-alkoxide process. Hofmann et al. modeled and experimentally investigated a periodically excited hybrid energy-harvesting generator. Together these papers represent significant advancement in the design and application of smart materials. Collectively, the authors have provided many new set of ideas that will benefit the future research of the community.

We would like to thank our workshop sponsors: National Nature Science Foundation of China; Nanjing University of Aeronautics and Astronautics; Soochow University; State key Laboratory of Mechanics and Control of Mechanical Structures. Their support is greatly appreciated by the host organizers and all the participants.