2017 Acta Materialia Silver Medal Award

The recipient of the 2017 Acta Materialia Silver Medal is Jing-yang Wang, the distinguished professor and division head in the High-performance Ceramic Division at the Shenyang National Laboratory for Materials Science and Institute of Metal Research, Chinese Academy of Sciences. He is also the assistant director of Shenyang National Laboratory for Materials Science.

Jingyang Wang received the B.A. degree in Physics in 1992 from Peking University, M.A. degree in 1995 and Ph.D. degree in 1998, both in Materials Physics from Institute of Metal Research, Chinese Academy of Sciences. He joined the faculty in Institute of Metal Research where he became the assistant professor in 1998, associate professor in 2002, and full professor in 2006. He was the visiting scientist at International Centre for Theoretical Physics (Italy) in 2001, University of Trento (Italy) in 2001, and International Center for Young Scientists (ICYS) at National Institute of Materials Science (Japan) in 2007.

Professor Wang focused over 15 years of research activities in the area of materials science of advanced engineering ceramics. He has published more than 180 peer-reviewed SCI papers (H-index factor 36), including 30 in *Acta Materialia* and *Scripta Materialia*, and has 17 patents in the field of ceramics. In addition, he presented ~50 keynote/invited talks and served 25 advisory board members and symposium organizers in international conferences. He is internationally recognized for his scientific contributions and leadership in high-throughput materials design and modeling, novel methods for processing bulk, low-dimensional and porous ceramic materials, and multi-scale structure-property relationship of high performance structural ceramics. His recent notable research contributions are:

- He established the theoretical criteria for predicting damage tolerant/quasi-ductile ceramics based on DFT calculations of chemical bonding heterogeneity and specific mechanical properties. Many new families, including MAX phases, RE_2SiO_5, $RE_2Si_2O_7$ and M_3AlN, were theoretically predicted and experimentally validated as novel damage tolerant/quasi-ductile ceramics.
- He proposed the strategic knowledge on tailoring the mechanical properties of nano-laminated carbides and nitrides by means of modifications on valence electron concentration and structural units in crystal structure, and further provided crucial guidelines on experimental activities. His work pioneered extensive investigations of the new family of nano-laminated carbides with the chemical formula of $(MC)_nAl_3C_2$ and $(MC)_nAl_4C_3$ (M=Zr and Hf, n=1, 2, 3, and 4).
- He presented the concept of optimal irradiation damage tolerance of transitional metal carbides (MAX phase and ZrC_{1-x}) through proper design of intrinsic point defect sinks, including the nano-twinned crystal structure and self-assembly of

carbon vacancies, respectively, inside the crystal structures. The knowledge inspired his challenging work on the low-temperature fabrication of the integrated Ti-Cr-Zr-Al-Si-C coating for accidental tolerant Zircaloy fuel cladding.

- He developed the integrated theoretical and experimental strategy to conduct high-throughput selection of low thermal conductivity ceramics, and have found more than 20 novel candidates. He also discovered an interesting pressure-induced softening of low-lying optic and acoustic phonon modes and significantly enhanced anharmonicity of Umklapp phonon scattering in complex silicates. The new mechanism could be adopted for phonon engineering and thermal conductivity modulation in lightweight and sustainable low thermal conductivity ceramics without heavy and/or rare earth elements.
- He disclosed the diverse dependences of macroscopic performance, including mechanical and thermal properties, as well as high temperature water vapor and CMAS corrosion resistances on chemical composition and crystal structure of dense and phase-pure X2-RE_2SiO_5 and β-$RE_2Si_2O_7$ rare-earth silicates. The information would initiate high-efficient materials design and optimization of RE-silicates for advanced T/EBC applications.
- He adopted multi-phonon scattering mechanisms in porous high-temperature ceramics that achieved the balance of extremely low thermal conductivity and excellent thermal stability up to 1500 ^{o}C. The novel thermal insulation materials covered from highly porous Y_2SiO_5 and $Y_2Si_2O_7$ silicates that are originally thermal insulators in dense ceramics to nano-SiC and nano-Si_3N_4 particle aggregates which intrinsically have very high thermal conductivity in bulk forms.

His contributions have been recognized on many scientific advisory boards and committees of the American Ceramic Society (ACerS) and the American Society of Metals International (ASM Int.) and serves on the International Advisory Board of UK CAFFE consortium (University of Cambridge, Imperial College London and University of Manchester) on ceramics for nuclear applications. He also served as the volume editor of *Ceramic Engineering and Science Proceedings* and is the book editor of *Developments in Strategic Materials and Computational Design,* both published by John Wiley & Sons, Inc., and is the Executive editor of *Journal of Materials Science and Technology* published by Elsevier.

Professor Wang's scientific career has also been recognized with many awards and honors, including ASM-IIM Visiting Lecturer Award in 2016, Distinguished Professor of CAS Distinguished Research Fellow Program from Chinese Academy of Sciences (CAS) in 2016, National Leading Talent of Young and Middle-aged Scientist Award from the Ministry of Science and Technology of China in 2015, DisLate Shri Sardar Pratap Singh Memorial Award from the Indian Ceramic Society in 2015, JACerS Author Loyalty Recognition Award in 2014 and the Global Star Award Society in 2012 from the ACerS, Second Prize in 2012 and First Prize in 2011 for Science and Technology Progress Award from China and First Prize for Natural Science Award from Liaoning Province in 2005.

The Acta Materialia Silver Medal honors and recognizes scientific contributions and

leadership from academic, industry and public sector leaders in materials research in the midst of their careers. The Silver Medal was established in 2016 and nominees are solicited each year from the Cooperating Societies and Sponsoring Societies of Acta Materialia. Inc. Professor Wang will receive the Silver Medal at the TMS Annual Meeting in San Diego in March 2017.