

Title: Micro-scaled plastic deformation of materials and microforming processes with their eluded challenges in industrial applications

Biodata:

Mingwang FU (M.W. FU) is the Chair Professor of Advanced Manufacturing in The Hong Kong Polytechnic University (HK PolyU). He is the Fellow of Society of Manufacturing Engineers (SME) and the Hong Kong Institute of Engineers (HKIE), and Royal Society of Wolfson Visiting Fellow. He is an Associate Director of Research Institute for Advanced Manufacturing in PolyU. From 1987 to 1995, Prof Fu worked as a faculty member in China. Upon completion of his PhD study in the National University of Singapore in 1997, he joined the Singapore Institute of Manufacturing Technology as a Senior Research Engineer. In Aug 2006, he joined The HK PolyU as a faculty member. Professor Fu is quite active in exploring advanced materials processing, multi-scaled manufacturing, metal forming, damage and fracture in manufacturing, structure fatigue in product service, and micro-mechanics in manufacturing. These efforts aim at seeking an epistemological understanding of the scientific nature behind these research arenas, advancing knowledge in these disciplines, and addressing a plethora of challenges and bottlenecked issues in these domains, and eventually developing the state-of-the art manufacturing processes for industrial applications. Professor Fu's researches benefited the development of the technologies in the above-described fields and led to about 300 journal publications, 6 monographs and one volume of the "Encyclopedia of Materials: Metals and Alloys" published by Springer-Verlag London Ltd, CRC Press, Taylor & Francis Group, and Elsevier. Professor Fu is also sitting in the editorial board or as Associate Editor of a number of prestigious journals, including Int. J. Plast, Int. J. Mach. Tools Manuf., Int. J. Mech. Sci., Mater. Des., Int. J. Damage Mech., Int. J. Adv. Manuf. Technol., Adv. Manuf., etc. He often gives keynote or plenary talk in many international conferences in different countries.



Abstract:

Micro-scaled plastic deformation of materials and its application in metal forming, viz., the so-called microforming, have been widely used in various industrial clusters and have more application potentials in bio-medical, micro-electronics and microelectronics consumer products. In micro-scaled plastic deformation and microforming process, size effect (SE) constantly exists due to the value change of size effect factors from the traditional macro-scale to micro-scale domain. Size effect factors are defined as the influencing parameters of the materials, structures or systems to be concerned whose value change would lead to different SE manifestations. In micro-scaled plastic deformation and microforming, SEs would induce the SE-related process behaviours, phenomena, and performances, which are different from those in macro-scale domains. SEs can also result in the scatters of process behaviours, phenomena, and the quality and property of the fabricated micro-scaled parts and components. The talk aims at presenting a panorama of SEs, their impacts and the bottleneck issues in micro-scaled deformation of materials and microforming, and how to address them to ensure the efficient realization of them in micro-scaled materials processing and manufacturing.