

Hybrid micromachining - a paradigm shift in micromanufacturing

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Abstract:

Micromanufacturing has attracted great attention as micro-components/products such as micro-displays, micro-sensors, micro-batteries, etc. are becoming established in all major areas of our daily life and can already be found across the broad spectrum of application areas especially in sectors such as automotive, aerospace, photonics, renewable energy and medical instruments. These micro-components/products are usually made of multi-materials (may include hard-to-machine materials) and possess complex shaped micro-structures but demand sub-micron machining accuracy. A number of micro-machining processes is therefore, needed to deliver such components/products.

The talk introduces the concept of hybrid micro-machining process which involves integration of various micro-machining processes with the purpose of improving machinability, geometrical accuracy, tool life, surface integrity, machining rate and reducing the process forces. It uses three typical hybrid micromachining processes to demonstrate the effectiveness of hybrid micromachining process in terms of machining performance and productivity. Development a new 6-axis hybrid micro machine tool and material handling system to implement the hybrid micromachining processes is also introduced. The talk concludes with the future research focus and challenges of hybrid micromachining in the new era of smart manufacturing.

Key words: hybrid micromachining; smart manufacturing; hybrid machine; control architecture

Biography: Xichun Luo is a Professor in ultra precision manufacturing and technical director of Centre for Precision Manufacturing at the University of Strathclyde (UK). He is an elected fellow of International Society for Nanomanufacturing and a member of scientific committee of European Society of Precision Engineering & Nanotechnology (euspen). He is an associate editor for Proceeding of IMechE Part C: Journal of Mechanical Engineering Science, Advances in Mechanical Engineering, Nanomanufacturing and Metrology, Mechanical Sciences and Journal of Micromanufacturing. He obtained his PhD in ultra precision manufacturing at Harbin Institute of Technology (China) and second PhD in Precision Engineering at Leeds Metropolitan University (UK). He worked at Cranfield University, Heriot-Watt University and University of Huddersfield before joined Strathclyde in 2013. He has strong research interests in ultra precision machining, micromachining and nanomanufacturing, supported by the EPSRC, EU and industries. He has published two books and more than 100 papers in peer-reviewed highly ranked journals. He won Institution of Mechanical Engineers (IMechE) 2015 Ludwig Mond Prize for his work in micro- and nano-manufacturing.