Increasing demand for micro-products in various industries has led to rapid advancement of technologies in materials, manufacturing processes, machines, tools and fixtures, as well as measurement and instrumentations. Though, the potential of micro-manufacturing to industries has yet fully realized and utilized. This special issue of the Journal of Applied Mechanics and Materials is devoted to a selection of papers from those presented at the 2nd International Forum on Micro Manufacturing (IFMM2012). IFMM2012 was hosted by the Guangzhou Chinese Academy of Sciences Institute of Advanced Technology and the South China University of Technology, and was held in Dec. 17 and 18 in Guangzhou, China. The theme of IFMM2012 is to build a bridge joining academic research and industrial needs in micro-manufacturing. The forum attracted many papers, and after a competitive review process, a total of 12 best papers from Japan, USA, China and Hong Kong are selected for this special issue.

Among those 12 papers, three papers were contributed by the keynote speakers. The paper by Prof. Reijo Tuokko, entitled “Micro and desktop factories for micro/meso-scale manufacturing applications and future visions,” offered a critical and comprehensive overview of current and future applications of micro and desktop production systems. The paper by Prof. Albert Shih, entitled “Tissue cutting mechanics and applications for needle core biopsy and guidance”, presented both mathematical and experimental efforts in gaining knowledge for better understanding tissue cutting mechanics and integrating more efficient needle and accurate insertion procedures for biopsy. The paper by Prof. Tatsuhiko Aizawa, entitled “Micro-texturing onto amorphous carbon materials as a mold-die for micro-forming,” investigated micro-forming techniques of imprinting micro-textures onto two types of amorphous carbon mold-die materials, and duplicating those micro-patterns onto metallic and polymer sheets.

There are five papers related to use micro-fabrication methods for specific applications such as medical diagnosis device, gas sensor, spectrometer component, optical filter and laser steering device. The paper entitled “A centrifugal microfluidics platform for potential application on immobilization-free bead-based immunoassays,” presented the fabrication of a simple and convenient “lab-on-a-disc” platform for bead-based immunoassays. The paper entitled “Characterization of nano-structured titania thin film and its application in gas sensor” exhibited a novel process to fabricate integrated nano-structured titania (NST) thin film at low temperature, and a successfully packaged NST gas sensor. The paper entitled “Design of a VLS grating-lens hybrid component for miniature spectrometer” proposed a micro varied-line-spacing (VLS) grating-lens hybrid component that integrates the functions of collimation, dispersion designed for spectrometer miniaturization. The paper entitled “Design and fabrication of an integrated multi-channel optical filter working in visible and near-infrared bands” presented a novel fabrication method combining pigment-based colorant photoresist microlithography with traditional multi-film vacuum deposition to produce multi-channel filters with higher integrated level and wider working wavelength range. The paper entitled “Dynamic analysis and structure parameters optimization of a parallel platform based on ADAMS” worked on an approach for optimizing dynamic analysis and structural parameters of a particular parallel platform for laser steering.

There are four interesting papers related to various topics of manufacturing. Among these papers, two papers aimed at solving specific problems in the field of acoustics. The first paper, entitled “The acoustic enclosure design of the refrigeration compressor,” proposed a new device of acoustic enclosure that effectively reduces the noise generated from food refrigeration compressors. The
second paper, entitled “Simulation of acoustic field for mega-sonic bath cleaning in advanced semiconductor manufacturing,” simulated the distribution of sonic pressure in a wet cleaning bath, based on which suggestions for the optimization of mega-sonic process were given. The other two papers are geared for solving practical problems in industries. The paper, entitled “Research of high performance closed loop control system for stepper motor,” presented a high performance double-loop controller for stepper motor by simulations. The paper, entitled “A new approach for prioritization of failure mode in FMECA using encouragement variable weight AHP,” proposed a novel approach that makes ranking results of failure modes more objective and accurate.

Finally, we would like to thank all the authors for their contributions. Thanks are also given to all referees without whose time and efforts this special issue would not be possible. Last but not least, we would like to thank Trans Tech Publications Ltd for publishing this special issue.

To the reader, we hope this special issue is useful.

Ruxu Du, Chairman, IFMM2012
Norio Takatsuji, Co-Chairman, IFMM2012
Zifu Li, Special Issue Manager
Jiaying Xu, Special Issue Secretary