# Editorial

Xiaofeng Zhao*

Electronics Engineering Institute,
Heilongjiang University,
Harbin 150080, China
E-mail: xiaofengzhao1996@163.com
*Corresponding author

Bin Li

Faculty of Biological and Chemical Engineering,
Kunming University of Science and Technology,
Kunming 650224, China
E-mail: kunminglibin@gmail.com

**Biographical notes:** Xiaofeng Zhao received his PhD at Heilongjiang University in 2008. Currently, he works in the Department of Electronics and Engineering of Heilongjiang University, Harbin, China as a Professor, Master Supervisor and Young Academic Backbone Teacher of Heilongjiang Province. He is interested in nanomaterials and nanodevices, sensor and micro electromechanical systems (MEMS). He is in charge of the project of National Natural Science Foundation of China and has published more than 20 research papers which are included in SCI, EI and so on.

Li Bin received his PhD degree in Kunming University of Science and Technology in 2012. And now, he works in the Faculty of Biological and Chemical Engineering, Kunming University of Science and Technology, Kunming, P.R. China as a Professor, and Master Supervisor. He is interested in intelligent control, data mining and intelligent detection. He has been in charge of the project of National Natural Science Foundation of China and published more than 20 research papers which are included in SCI, EI and so on.

This special issue comprises six selected and extended papers from the 2013 2nd International Conference on Applied Materials and Electronics Engineering (AMEE 2013). The conference received 412 submissions from 16 countries and regions, of which 210 were selected for presentation after a rigorous review process; the guest editors selected six as the best papers on electronic materials and applications. These six papers came from China, Korea, Malaysia, Thailand and Taiwan, and focus on nanomaterials and nanotechnology, optoelectronic materials, electronic materials and computing.

We would like to take this opportunity to thank the authors for the efforts they put in the preparation of the manuscripts and for their valuable contributions. We wish to express our deepest gratitude to the committee members for their help in selecting papers for this issue and especially the referees of the selected papers for their thorough reviews under a tight time schedule. Last, but not least, our thanks go to the editorial board of the *International Journal of Materials and Product Technology* for their exceptional efforts throughout this process.

'Prediction of fatigue life of packaging EMC material based on RBF-SVM', by Hai Guo, Jinghua Yin, Jingying Zhao, Zhiyu Huang and Yue Pan, applies a radial basis function support vector machine (RBF-SVM) for predicting fatigue life of packaging elastic memory composites (EMC) material. EMC is one of the three dominating materials in the FOL packing. Using EMC to encapsulate the large-scale integrated circuit has predominated research in the areas all over the world. Till now, more than 95% of microelectronic devices are PEMs. In this study, a RBF-SVM model was constructed to predict life of EMC material and the penalty parameter C and nuclear parameter R was optimised. Meanwhile, a comparison between the predictions of BP neutral network, polynomial kernel, sigmoid kernel, and RBF kernel was made. Experiments show that the SVM (RBF-SVM) has higher complexity and prediction accuracy than polynomial kernel and sigmoid kernel have, and its prediction accuracy is far higher than that of BP neutral network model. According to the predictions, RBF-SVM is very suitable for applying in the prediction of fatigue life of packaging EMC material and receives good prediction complexity and accuracy.

'Design and fabrication of a metal-based asymmetric and variable Y-branch plastic optical fibre coupler', by A.A. Ehsan, S. Shaari and M.K. Abd Rahman, presents the development of metal-based asymmetric and variable plastic optical fibre (POF) couplers. The metal-based POF devices are designed based on two optical designs: a Y-branch structure with a novel hollow waveguide taper and an attenuation technique based on lateral displacement of two fibres. The non-symmetrical coupling ratios are obtained by attenuation due to the lateral displacement of two adjoining fibres. The device has been fabricated on a metal block using high speed CNC machining tool. The fabricated device has an excess loss of 6.3 dB while the coupling ratios are 46.27% and 53.73% when operating as a 3 dB coupler. In the asymmetric coupler mode, the coupling ratio ranges from 14.23% to 85.77% with excess loss varying from 6.3 dB to 8.33 dB. In the variable coupler mode, the device provides coupling ratios of 17.32% to 82.68% and excess loss varying from 6.71 dB to 9.72 dB.

'Punch-through and junction breakdown characteristics for uniaxial strained nano-node metal-oxide-semiconductor field-effect transistors on (100) wafers', by Mu-Chun Wang, Heng-Sheng Huang, Min-Ru Peng, Shea-Jue Wang, Tsao-Yeh Chen, Wen-Shiang Liao, Hsin-Chia Yang, and Chuan-Hsi Liu, demonstrates a justification metrology to clarify the predominant leakage mechanism of N/PMOSFET devices coming from punch-through effect or junction breakdown issue, especially for local strained nano-node devices. In the nano-regime MOSFET devices, the punch-through effect is more distinct, retarding the reliability tolerance, such as electro-static discharge or latch-up applications. Through the measurement in various device lengths under contact-etch-stop-layer strain process or without strain effect for 45 nm complementary MOS process, the difference of punch-through effect and junction breakdown integrity were able to be classified and exhibited in design applications. After tested data analysis, the junction breakdown issue in PMOSFET was usually greater than that in NMOSFET due to the doping concentrations and the doping species. Generally, the junction breakdown value is independent of channel length variation except the existence of some damage close to the gate/source or gate/drain fringe. In addition, the punch-through voltage for PMOSFET as source/drain current IDS = 1 μA also larger than that for NMOSFET was observed.

'Software architecture and stress tracker utilising nanofibre technique-based smart clothes', by Hee-Cheol Kim, Tae-Woong Kim, Mun-Il Joo, Jun-Su Kim, Kayoung Lee,

Yao Meng, Sang-Hoon Yi, and Gi-Soo Chung. Smart clothes containing nanoweb-based biosensors to acquire vital signs, known as wellness wear, have great potentiality as a wearable computing device that helps to care for and promote health, including chronic disease prevention, obesity control, and stress management. Firstly, this paper presents a wellness wear system that we are currently developing, primarily discussing two crucial technologies of nanoweb-based biosensors and digital yarns transmitting data. Particularly, these two technologies play an important role to support comfort and wearability. Secondly, emphasising the value of software of the wellness wear system, this paper presents both software architecture, essential as a fundamental basis to provide sustainable and seamless various medical services, and a software application involving a stress tracker working together with the wellness wear system. The stress tracker is an application programme running on an Android-based smart phone, which analyses the electrocardiograph (ECG) data obtained from wellness wear, evaluates users' autonomous nervous system (ANS) which controls mental stress, and gives them proper biofeedback. For this, the programme utilises its standard deviation of all normal to normal RR intervals (SDNN), its ratio of the low frequency (LF) and the high frequency (HF) from heart rate variability (HRV) extracted from the ECG raw data.

'A study of the nanomachining and nanopatterning on different materials using atomic force microscopy', by Jen-Ching Huang, Yung-Jin Weng, and Huail-Siang Liu, investigated the nanomachining and nanopatterning on different materials using an atomic force microscope. Straight-line nanomachining was applied to materials, namely, mica, polycarbonate (PC), and gold, under different loading forces in order to understand the appearance and the accumulation of chips of different materials after nanomachining. This study used C++ grammar to compile programme, and discuss nanopatterning capabilities upon by NanoLithography software on PC, and gold. The results show that the loading force of the probe is greater, the cutting depth would also increase, and the trend showed logarithmic. And it can be found that the chip accumulation behaviour on mica, PC, and gold is different. This study successfully fabricated micro-scaled Chinese characters on PC and circular nano-patterns with a diameter of 500 nm and complex nano-patterns by the linear combination on the gold sample. It found that segments of circular shape consisting of straight lines can affect the outside shape of the circle. In addition, complex nanopatterns are machined within the range of 1,000 nm.

'Removing the transients electron trapping in P-N junction diode by using soft X-ray annealing method', by Surada Ueamanapong, Itsara Srithanachai, Surasak Niemcharoen and Amporn Poyai, presents new results of the characteristics of P-N junction diode after treat by using X-ray annealing technique. Low reverse-bias current (IR) is an important indicator for P-N junction quality classification. Its value affects the performance of various range of semiconductor devices, such as solar cells, power devices, photodetector, etc. There are many causes which can degrade the performance of P-N junction diodes such as damage by high energy ion implantation and contaminations. It has been observed frequently that in the case of a high energy ion implantation, the residual damage is difficult to remove by thermal annealing. Although, thermal annealing technique is important for fabrication process, it takes a long time to complete. Thus, this paper will show a new technique for removing defect in the bulk silicon take shorter time is soft X-ray annealing fabrication process. The diodes, which were used in the experiment, were fabricated with CMOS technology and measured by using cascade Microtech M150 probe station. The I-V characteristics of the device has been acquired

from –10 to 1 V under temperature variation of 30–80ºC. At the specific condition of –3 V, 80ºC humps occurred on the curve and when the device was exposed to X-ray at energy of 40, 55 and 70 KeV. The humps were then shifted toward 0 V. Activation energy revealed the presence of a non-uniform density of electron traps corresponding to a broad range of energy levels from about 0.65–0.67 eV above the intrinsic band. Soft X-ray annealing can remove or change the position of hump transient. Therefore, this technique can improve the device performance and important to semiconductor industrial.

In closing, we sincerely hope that you will enjoy reading this special issue.