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EDITORIAL

Advanced Microelectronic and Nanoscale Semiconductor Materials & Applications

The continued shrinkage of micron-scale and nanoscale electronics and optoelectronics has required considerable challenges to be overcome in recent years. Novel and improved metrologies are required for supporting progress in the functionality, performance, cost-effectiveness, and mass production of devices and integrated components [1 - 12]. Therefore, additional processes and architectural and material requirements are necessary and are currently imposed for the advanced manufacturing of such devices. In this special issue, we address six parts (seven articles) indicating technological progress. We identified six key elements that a new fabrication technology must satisfy to overcome the challenges of ever-decreasing dimensions.

This special issue begins by reviewing seven articles regarding all aspects of characterization technology required for the development and manufacture of advanced microelectronic and optoelectronic devices. The majority of this special issue reviews papers covering essential concerns in optoelectronics, communication components, taste sensors, electromagnetic shielding materials, nanocontact printing, cascode low noise amplifiers (LNAs), and associative memory applications.

Part 1 describes a paper reporting the thermal annealing influence on the emission characteristic of n-gallium nitride (GaN) materials and GaN devices. In addition, the luminescence intensity and emission life time were improved at a typical annealing temperature.

Part 2 describes a study that fabricated gallium arsenide (GaAs) power metal–semiconductor field effect transistors (MESFETs) by using double ion implantation technology for wireless communications. The power performance of the MESFET for the code division multiple access (CDMA) wireless communication applications was studied.

Part 3 describes a study in which the authors developed a chemical sensor array with seven chemical sensors. The designed sensors were categorized into two groups: the first group mainly comprises conductive polymer, and the second group comprises of a biomimic material. Furthermore, six sports drinks were identified and classified in the salt area.

Part 4 focuses mainly on the characteristic analysis of various electromagnetic shielding materials by using the various shielding effectiveness (SE)-measuring methods developed by TDK and ASTM.

Part 5 describes a paper on nanocontact printing technology, which is a promising next-generation lithography technique because of its low-cost and high-throughput patterning. Nanocontact printing by using hydrogen silsesquioxane soft stamps was studied for fabricating nanobio devices.

Finally, Part 6 describes a study in which two electronic applications, cascode LNA and associative memory, were implemented in a complementary metal-oxide semiconductor (CMOS) circuit involving submicron silicon technologies.

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