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Nitride Devices Prepared on Flexible Substrates

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It is well known that devices based on group III nitrides show high performance. In fact, InGaN multiple quantum wells (MQWs) are widely used for white and blue light emitting diodes (LEDs) and blue laser diodes (LDs). AlGaN/GaN high electron mobility transistors are considered to be key devices for low energy consumption society. However, their applications are quite limited in the small area devices because of the high fabrication cost by the use of sophisticated techniques such as MBE or MOCVD. To solve this problem and fabricate low-cost GaN devices, we have to develop a highly productive crystal growth technique. We have recently found that a new growth technique called PSD (pulsed sputtering deposition) allows us to obtain device quality III nitrides even at room temperature and we can fabricate various high performance devices such LEDs, HEMTS, and MISFETs with it [1-4]. PSD has already attracted much attention of industry engineers because its productivity is much higher than that of conventional MOCVD. It should be also noted that there already exist a large number of sputtering machines in the microelectronics industry such as LCD or Si-IC fabrication lines. In this technique, surface migration of the film precursors is enhanced and, therefore, the temperature for epitaxial growth is dramatically reduced. This reduction allows us to utilize various large area low cost substrates that have never been used for growth of semiconductors so far due to their chemical vulnerability. As low-cost large area substrates, we have investigated feasibility of metal foils, mica sheets, and highly oriented graphite sheets. These materials are inexpensive and show high crystallinity as well as flexibility. We have also found that the low growth temperature also helps to solve problems that stem from thermal expansion mismatch between nitride films and substrates. In this presentation, we will show successful epitaxial growth of GaN and operation of various GaN based devices on low-cost flexible substrates such as metal foils, graphite sheets, and mica sheets by the use of PSD.

References

1. E. Nakamura, K.Ueno, J. Ohta, H. Fujioka, and M. Oshima, Applied Physics Letters, **104**, 051121 (2014).
2. T. Watanabe, J. Ohta, T. Kondo, M. Ohashi, K. Ueno, A. Kobayashi, and H. Fujioka, Appl. Phys. Lett. **104**, 182111 (2014).
3. M. Oseki, K. Ohkubo, A. Kobayashi, J. Ohta, and H. Fujioka, Scientific Reports 4, 3951 (2014).
4. K. Sato, J. Ohta, S. Inoue, A. Kobayashi, and H. Fujioka, Applied Physics Express 2 011003 (2009).