SESSION 3 – TAPA II
Emerging Memory Technologies I

Tuesday, June 15, 10:20 a.m.
Chairpersons: C. Dennison, Ovonyx
H. Matsuoka, Hitachi

3.1 — 10:20 a.m.
Novel μTrench Phase-Change Memory Cell for Embedded and Stand-Alone Non-Volatile Memory Applications, F. Pellizzer, A. Pirovano, F. Ottogalli, M. Magistretti, M. Scaravaggi, P. Zuliani, M. Tosi, A. Benvenuti, P. Besana, S. Cadeo, T. Marangon, R. Morandi, R. Piva, A. Spandre, R. Zonca, A. Modelli, E. Varesi, T. Lowrey*, A. Lacaita+, G. Casagrande, P. Cappelletti and R. Bez, STMicroelectronics Central R&D, Agrate Brianza, Italy, *Ovonyx, Inc., Rochester, MI, and +Politecnico di Miano, Milan, Italy

A novel cell structure for chalcogenide-based non-volatile Phase-Change Memories is presented. The new utrench approach is fully compatible with an advanced CMOS technology, is highly manufacturable and allows to optimize array density and cell performance. Programming currents of 600 uA, endurance of 10E11 programming cycles and data retention capabilities for 10 years at 110ºC have been demonstrated. The manufacturability is proven by experimental results from multi-megabit arrays.

3.2 — 10:45 a.m.
Full Integration and Cell Characteristics for 64Mb Nonvolatile PRAM, S.H. Lee, Y.N. Hwang, S.Y. Lee, K.C. Ryoo, S.J. Ahn, H.C. Koo, C.W. Jeong, Y.-T. Kim, G.H. Koh, G.T. Jeong, H.S. Jeong and K. Kim, Samsung Electronics Co., Ltd., Kyunggi-Do, Korea

We have integrated a 64Mb nonvolatile random access memory using phase transition phenomena. Based on 0.18um-CMOS technologies, the vertical contact typed memory cell is fabricated. The device density can be sharply increased with decreasing the writing current and the GST size. But, for reduction of writing current, issues including set and interface resistances should be stabilized. Additionally, our results also show the feasibility of 256Mb nonvolatile PRAM with writing time below 100ns.

3.3 — 11:10 a.m.
A Study for 0.18um High-Density MRAM, M. Motoyoshi, I. Yamamura, W. Ohtsuka, M. Shouji, H. Yamagishi, M. Nakamura, H. Yamada, K. Tai, T. Kikutani, T. Sagara, K. Moriyama, H. Mori, C. Fukumoto, M. Watanabe, H. Hachino, H. Kano, K. Bessho, H. Narisawa, M. Hosomi and N. Okazaki, Sony Corporation, Kanagawa, Japan

The switching behavior of MTJs is studied with various kinds of their sizes and shapes. In ellipse like shaped MTJ, aspect ratio more than 2 is enough for reliable switching characteristics. The optimization of the MTJ pattern and the process makes 21.4 sigma 0/1 separation. In further study about MTJ shape, we found a new "Saturn" shaped MTJ has best switching behavior. Also the toggle mode MRAM is evaluated and its effectiveness for high speed programming is confirmed.

3.4 — 11:35 a.m.
MRAM with Novel Shaped Cell Using Synthetic Anti-Ferromagnetic Free Layer, Y.K. Ha, J.E. Lee, H.-J. Kim, J.S. Bae, S.C. Oh, K.T. Nam, S.O. Park, N.I. Lee, H.K. Kang, U-I Chung and J.T. Moon, Samsung Electronics Co., Ltd., Gyunggi-Do, Korea

Magnetic random access memory (MRAM) with magnetic tunnel junction (MTJ) using synthetic anti-ferromagnetic (SAF) free layers of various shapes has been developed. SAF free layers show the predominance in the scalability compared with a conventional single free layer. It is also revealed that a novel shaped MTJ with a SAF free layer has a remarkably large writing margin.