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Fabrication of magnetic random access memory based on nanoring-type magnetic tunnel junctions and spin-polarized current driving X.F. HAN[1], H.X. WEI, Z.L. PENG, H.D. YANG, J.F. FENG, G.X. DU, Z.B. SUN, L.X. JIANG, Q.H. QIN, M. MA, Y. WANG, Z.C. WEN, D.P. LIU, W.S. ZHAN, Institute of Physics, Chinese Academy of Science, Beijing 100080, China — Nanoring-type magnetic tunnel junctions (NR-MTJs) of Ta/IrMn/CoFe/Ru/CoFeB/Al-O/CoFeB/Ta/Ru were nano-fabricated on the Si/SiO_2 substrate. The small NR-MTJs with the outer- and inner-diameter of 100 and 50 nm were nano-fabricated and the corresponding NR-MTJ array integrated above the transistors in CMOS circuit for 4x4 MRAM DEMO devices. The magnetoresistance (R) versus current (I) loops for a spin-polarized current switching were measured and the TMR ratio larger than 20% at room temperature were observed. The critical switching current for the free CoFeB layer between parallel and antiparallel magnetization states is smaller than 750 μA in such NR- MTJs. After each positive and negative pulse writing current the high and low resistance of a NR-MTJ as a MRAM bite were read out using a low read current of between 10 and 20 μA. It shows that the MRAM fabrication with the density higher than 5 Gbite/inch^2 are possible based on 1 NR-MTJ + 1 transistor structure and spin-polarized current switching.

[1]Correspondence author

X. F. Han
Institute of Physics, Chinese Academy of Science, Beijing 100080, China

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