Optimized MTJ Cell Design for high selectivity MRAM

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Among the next generation memory technology, MRAM(magnetic random access memory) has been interested with its nonvolatility, high endurance, and high speed [1]. To achieve the high density, selectivity becomes an important issue. The asteroid curve which represents the MTJ (magnetic tunnelling junction) cell shape and magnetic properties, is the key factor that we can determine the cell selectivity. Especially the shape of asteroid curve is important and L-shape is expected to have the high selectivity.

We simulated for 4 different cell shapes, 3 aspect ration(A.R) (1;1.5, 1:2, 1:3), with 2 width (0.2um, 0,4um) with fixed thickness (3nm) using micromagnetics model and optimized the cell propertiesfor high selectivity. The calculated asteroid curves sensitively depend on the shapes and initial states of MTl cell. One of results is shown in Figure 1. The jump comes from the cortex forming during the magnetization reversal process. In the paper, we will show the parametric study results and some ideas to improve the selelctiviy further. Also some experimental results from the wafer level MRAM array will be compared with the simulation results..

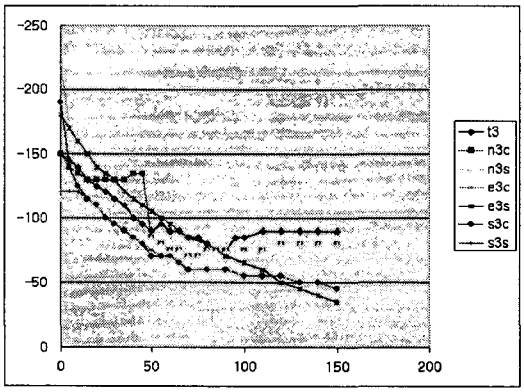

Fig.1. Asteroid curve for A.R. =1:3.

References

[1] M, Motoyoshi et.al Symp. VLSI Tech (2002).