

MA 47: Spintronics I/ Spin-dependent Transport/ Spin Torque - Invited Talk

Time: Thursday 10:15–10:45

Location: HSZ 04

Invited Talk

MA 47.1 Thu 10:15 HSZ 04

Perpendicular 40 nm MgO-CoFeB Magnetic Tunnel Junction

— ●HIDEO OHNO — Center for Spintronics Integrated Systems, Tohoku University, Sendai, Japan — Res. Inst. Elec. Commun., Tohoku University, Sendai, Japan

Magnetic tunnel junction (MTJ), a spintronic device, can lead not only to fast, non-volatile, high density stand-alone/embedded RAMs but also to a possibility of constructing compact, nonvolatile, low-power CMOS VLSI processors employing logic-in-memory architecture [1]. To this end, an MTJ has to meet the following conditions at the same time: (1) thermal stability factor E/kBT greater than 40 at a reduced footprint, (2) resistance area product below 20 Ohm micrometer² to allow current-induced switching, (3) intrinsic switching current IC_0 of

F micro A or below in a device having a feature size of F nm, (4) high tunnel magnetoresistance over 100%, and (5) BEOL compatibility capable of going through 350 °C annealing required for standard semiconductor processing without losing its high TMR ratio. Utilizing the perpendicular interface anisotropy at MgO-CoFeB, we show that these five conditions can nearly be met in a device having a 40 nm diameter [2]. I conclude my talk with prospects along with the remaining challenges.

[1] S. Ikeda, et al., IEEE Trans. ED, 54, 991, 2007. [2] S. Ikeda, et al., Nature Materials, 9, 721, 2010.

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