KIST Spintronics 발표 4

Selected Topics on Spin Memory Devices

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Current induced magnetic reversal due to spin transfer torque is one of most important research topics in KIST Spintronics research program because it is not only interesting academically but useful as a promising candidate in advanced information storage technology. First part of this work reports the field-dependence of switching-currents for current induced magnetization switching in a uncoupled nano-sized cobalt-based spin valve of exchange biased type. The dependency is investigated in hysteretic regime at room temperature, in comparison with that of a trilayer simple spin valve. In the simple spin valve, the switching currents behave to the positive and the negative applied magnetic field symmetrically. In the exchange biased type, in contrast, the switching currents respond to the negative field in a quite unusual and different manner than to the positive field. A negative magnetic field then can shift the switching-currents into either negative or positive current range, dependently on whether a parallel or an antiparallel state of the spin valve was produced by that field. This different character of switching currents in the negative field range can be explained by the effect of the exchange bias pinning field on the spin-polarizer (the fixed Co layer) of the exchange biased spin valve. That unidirectional pinning filed could suppress the thermal magnetization fluctuation in the spin-polarizer, leading to a higher spin polarization of the current, and hence a lower switching current density than in the simple spin valve. Second part of the talk will cover recent progress on various spin memory materials and devices such as a unipolar spin device, a massive memory device utilizing the domain wall motion by an applying current, alloys showing a negative MR, and so on.