Optimization of spin-valve structure NiFe/Cu/NiFe/IrMn for planar hall effect based biochips

Tu B.D., Cuong L.V., Hung T.Q., Giang D.T.H., Danh T.M., Duc N.H., Kim C.

Department of Nano Magnetic Materials and Devices, College of Technology, Vietnam National University, Hanoi, Viet Nam; Laboratory for Micro-Nano Technology, College of Technology, Vietnam National University, Hanoi, Viet Nam; Department of Materials Science and Engineering, Chungnam National University, Yuseong, Daejeon 305-764, South Korea

Abstract: This paper deals with the planar Hall effect (PHE) of Ta(5)/NiFe(t_F)/Cu(1.2)/NiFe(t_p)/IrMn(15)/Ta(5) (nm) spin-valve structures. Experimental investigations are performed for 50 ?m??50?m junctions with various thicknesses of free layer (t_F = 4, 8, 10, 12, 16, 26 nm) and pinned layer (t_p = 1, 2, 6, 8, 9, 12 nm). The results show that the thicker free layers, the higher PHE signal is observed. In addition, the thicker pinned layers lower PHE signal. The highest PHE sensitivity S of 196 ?V/(kA/m) is obtained in the spin-valve configuration with t_F = 26 nm and t_p = 1 nm. The results are discussed in terms of the spin twist as well as to the coherent rotation of the magnetization in the individual ferromagnetic layers. This optimization is rather promising for the spintronic biochip developments. ?? 2009 IEEE.

Author Keywords: Biosensors; Hall effect; Magnetization reversal; Magnetoresistance; Magnetoresistive devices

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1. Tu, B.D., Department of Nano Magnetic Materials and Devices, College of Technology, Vietnam National University, Hanoi, Viet Nam
2. Cuong, L.V., Laboratory for Micro-Nano Technology, College of Technology, Vietnam National University, Hanoi, Viet Nam
3. Hung, T.Q., Department of Materials Science and Engineering, Chungnam National University, Yuseong, Daejeon 305-764, South Korea
4. Giang, D.T.H., Department of Nano Magnetic Materials and Devices, College of Technology, Vietnam National University, Hanoi, Viet Nam
5. Danh, T.M., Department of Nano Magnetic Materials and Devices, College of Technology, Vietnam National University, Hanoi, Viet Nam
6. Duc, N.H., Department of Nano Magnetic Materials and Devices, College of Technology, Vietnam National University, Hanoi, Viet Nam, Laboratory for Micro-Nano Technology, College of Technology, Vietnam National University, Hanoi, Viet Nam
7. Kim, C., Department of Materials Science and Engineering, Chungnam National University, Yuseong, Daejeon 305-764, South Korea

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