**Engineering of Interlayer Exchange Coupling with the Insertion of a Heavy Metal Layer in Planar Hall Sensors**

***Mustafa ÖZTÜRK1,\****

*1* *Faculty of Science, Department of Physics, Gebze Technical University, 41400 Gebze, Kocaeli, Turkey*

|  |
| --- |
|  **Abstract**Due to their low power consumption, thermal stability, high performance in the low magnetic field and high signal-to-noise ratio, planar Hall sensors (PHS) have always been in a prominent position among magnetoresistive sensors [1,2]. PHS have potential applications in technological devices such as producing biosensors, microcompasses, blood pressure detectors, and microcrack detectors [1,2]. A PHS structure can conventionally be formed by using a single ferromagnetic (FM) layer or a bilayer consisting of an FM and antiferromagnetic (AF) layer, or a trilayer consisting of an FM, non-magnetic (NM) and AF layers [1]. Recently, bilayers consisting of an FM and heavy metal (HM) thin layers without an AF are offered as magnetoresistive sensor in the literature [1,3]. For a promising PHS, it is important to improve properties such as stability, reproducibility, selectivity, lower detection limits, ease of fabrication, field linearity, and sensitivity [1,4]. In this study, inspired by the idea of FM/HM bilayers, a special trilayered PHS is produced by inserting a Pt HM layer as an NM layer between FM and AF layers to improve the some of the mentioned properties of PHS, especially its sensitivity. This work was supported by the Research Fund of the Gebze Technical University through the project number: BAP 2022-A-105-33. |
| Keywords: Magnetic sensors, Planar Hall effect, Exchange coupling, Heavy metal |

**References**

1. Elzwawy, A., Piskin, H., Akdoğan, N., Volmer, M., Reiss, G., Marnitz, L., Moskaltsova, A., Gurel, O., & Schmalhorst, J. (2021). Current trends in planar Hall effect sensors: evolution, optimization, and applications. Journal of Physics D: Applied Physics, 54, 353002.
2. Lim, B., Mahfoud, M., Das, P.T., Jeon, T., Jeon, C., Kim, M., Nguyen, T.-K., Tran, Q.-H., Terki, F., & Kim, C. (2022). Advances and key technologies in magnetoresistive sensors with high thermal stabilities and low field detectivities. APL Materials, 10(5), 051108.
3. Xu, Y., Yang, Y., Xie, H. & Wu, Y., (2019). Spin Hall magnetoresistance sensor using AuxPt1−x as the spin-orbit torque biasing layer. Applied Physics Letter, 115, 182406.
4. Pişkin, H., & Akdoğan, N. (2019). Interface-induced enhancement of sensitivity in NiFe/Pt/IrMn-based planar hall sensors with nanoTesla resolution. Sensors and Actuators A: Physical, 292, 24-29.