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Effect of NiFeCr buffer and capping layers on the exchange bias and planar Hall voltage response of magneto-resistive sensors based on NiFe/Au/IrMn tri-layers

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The research in the magnetoresistive sensors field took massive contributions in the recent few decades. Amongst these magnetoresistive sensors, the planar Hall effect based ones has an improved signal to noise ratio and low offset values. In our current work we present the role of the NiFeCr as a buffer and capping layers over the tri-layer structure NiFe/Au/IrMn sensors. Cross junctions, based on NiFe/Au/IrMn structures were grown on Ta and NiFeCr seed layers by magnetron sputtering. The effects of replacement of Ta with NiFeCr in seed and capping layers on an exchange bias field are studied. A threefold improvement of the exchange bias value in the structures, grown with NiFeCr seed and capping layers, is demonstrated. The structural and magnetic reasons for this effect are discussed. Formation of clusters in the NiFeCr capping layer is proved by atomic force microscopy technique. Ta replacement on NiFeCr in the capping layer results in the enhancement of magnetoresistive response as well as a reduction of the noise.

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