Stable room temperature magnetocurrent in permeable n-type metal base transitor based on electrodeposited Iron-Nickel alloy (NiFe) and Zinc Oxide (ZnO) thin films

Trabalho #08

> Apresentação Oral
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Transistors undoubtedly provided the most important scientific-technological revolution of the twentieth century. Basically, the transistor is a semiconductor device with three-terminals typically called emitter, collector and base, capable to amplify or switch electronic signals. Nowadays, the most common application of transistors is for computer memory chips, including solid-state multimedia storage devices, microprocessors, and most important for us, sensors in overall. In this proposal we worked on the design, fabrication and characterization of a n-type permeable metal base transistor (MBT) based on electrodeposited Iron-Nickel alloy (NiFe) and Zinc Oxide (ZnO) thin films. NiFe was electrodeposited on n-type silicon substrates playing the role of the device's base and similarly the ZnO was electrodeposited on NiFe layer playing the role of the device's emitter. The base permeability was rigorously investigated by electrical percolation, by analyzing resistance versus NiFe deposition time, which also provided an estimate of NiFe thickness evolution. The magnetic and magnetoresistive characterization of NiFe base with 15 s of electrodeposition revealed a saturation field around 400 Oe, a coercivity of 70 Oe, and a longitudinal anisotropic magnetoresistance (AMR) of around 0.12%. Common-base transistor measurements at room temperature with and without 200 Oe (in-plane) magnetic field applied showed a common-base device gain of $\mapsto$ = 0.96, this value is related to the base permeability due to observed pin-holes. Intending to operate as a magnetic sensor, MBT must present sensitivity not only during common-base measurements but also under a fixed parameter. Thus, setting a reverse bias of VC = 1V and emitter current of IE = 45 $\mp$A, under external field sweep, we observed for the first time a stable room temperature magnetocurrent. This result suggests that the proposed device is a promising candidate to be applied as a commercial magnetic sensor.

Comentários adicionais

> Esse é o trabalho de mestrado do primeiro autor publicado na Applied Physics Letter. O segundo autor do artigo está dando continuidade no trabalho em seu doutorado.