

ABSTRACT

MAGNETORESISTANCE ANALYSIS BASED THIN FILM GIANT MAGNETORESISTANCE (GMR) ON POLYETHYLEN GLYCOL (PEG) COATED COBALT FERRITE NANOPARTICLES (CoFe₂O₄)

by

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12/339473 / PPA / 03941

Magnetoresistance measurements were carried out in a thin film of the spin valve GMR structure CoFeB / Cu / CoFe / MnIr by varying the thickness of the barrier layer of Cu (2,2 and 2,8 nm) and CoFeB free layer (7 and 10 nm) using System Four Point probe Method (SFPPM) in the external field 0-600 Gauss. It was found that the changes in the resistance range were (69,29 – 71,74) Ω for Cu 2,2 nm and (38,5 – 40,47) Ω for Cu 2,8 nm. In variations of CoFeB thickness, the changes in the resistance range for the thickness of 7 nm and 10 nm were (38,74 to 41,11) Ω and (69,29 – 71,74) Ω respectively. Furthermore, a thin layer is used as a magnetic sensor to detect the presence of CoFe₂O₄ nanoparticles, PEG coated CoFe₂O₄ and CoFe₂O₄ modified by PEG that was bonded with formalin biomolecules. A shift in resistance value occurs when a thin layer of the coated magnetic nanoparticles. This suggests that the thin layer of the GMR is able to detect the behavior of magnetic spins of CoFe₂O₄ magnetic nanoparticles.

Keywords: Giant magnetoresistance, thin film, CoFe₂O₄ nanoparticles, polyethylen glycol

INTISARI

ANALISA MAGNETORESISTANCE BERBASIS LAPISAN TIPIS GIANT MAGNETORESISTANCE (GMR) PADA NANOPARTIKEL COBALT FERRITE (CoFe₂O₄) DILAPISI POLYETHYLEN GLICOL (PEG)

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Telah dilakukan pengukuran *magnetoresistance* pada lapisan tipis *spin valve* GMR yang memiliki struktur CoFeB/Cu/CoFe/MnIr dengan memvariasikan ketebalan lapisan *barrier* Cu (2,2 dan 2,8 nm) dan *free layer* CoFeB (7 dan 10 nm) menggunakan *System Four Point Probe Method* (SFPPM) pada medan eksternal 0-600 gauss. Dihasilkan perubahan *range* resistansi (69,29-71,74) Ω untuk Cu 2,2 nm dan (38,5-40,47) Ω untuk ketebalan Cu 2,8 nm. Pada variasi ketebalan CoFeB dihasilkan perubahan *range* resistansi untuk ketebalan 7 nm dan 10 nm masing-masing adalah (38,74-41,11) Ω dan (69,29-71,74) Ω. Selanjutnya lapisan tipis digunakan sebagai sensor magnetik untuk mendeteksi kehadiran nanopartikel CoFe₂O₄, CoFe₂O₄ yang dimodifikasi PEG dan CoFe₂O₄ termodifikasi PEG yang telah mengikat biomolekul formalin. Terjadi pergeseran nilai resistansi ketika lapisan tipis dilapisi nanopartikel magnetik tersebut. Hal ini menunjukkan bahwa lapisan tipis GMR mampu mendeteksi perilaku spin pada nanopartikel magnetik CoFe₂O₄.

Kata kunci : *Giant magnetoresistance*, lapisan tipis, nanopartikel CoFe₂O₄, *Polyethylen Glicol*