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# Magnetic Property of Red Blood Cell under High Frequency and Low Magnetic Field

Jong-Gu Choi[1]*, Do-Guwn Hwang[1,2], Jang-Roh Rhee[3] and Sang-Suk Lee[1,2]
[1]Dept. of Eastern-western Biomedical Engineering, Sangji University, Wonju 220-702, Korea
[2]Dept. of Oriental Biomedical Engineering, Sangji University, Wonju 220-702, Korea
[3]Department of Physics, Sookmyung Women' University, Seoul 140-742, Korea

A highly sensitive, gaint magnetoresistance-spin valve(GMR-SV) biosensor with high linearity and very low hysteresis was fabricated by photolithography. The detection of Fe-hemoglobin inside red blood cells using the GMR-SV biosensing device was investigated. MR signal measuring system was attached to the optical microscope to observe the capture status and the mobility of red blood cell(RBC). After micro-lithography patterning process, the condition of external magnetic sensitivity and the limit range of changeable magneto-resistive property were studied. When a sensing current of 1 mA was applied to the current electrode in the patterned active devices with an area of $1\times5\ \mu m^2$ the output signal was about 13.35 mV. The signal from even one drop of human blood in saline water was sufficient for detection and analysis of RBC[1]. On the other side hand, the mobility and orientation of RBCs has been investigated in high frequency and low magnetic field by applying the micro-track channel with coil one-turn coil [Fig. 1]. The frequency and magnitude of magnetic field applied to coil are 20 kHz with sinusoidal wave and 1～10 μT with 1～100 μA, respectively. RBCs are captured and oriented to the perpendicular direction of the magnetic field. This change of capture status and orientation probably arises from the magnetic anisotropy and the induced pulse impedance in RBC's membrane of partially aligned Fe-hemoglobin molecules in a cell[2].

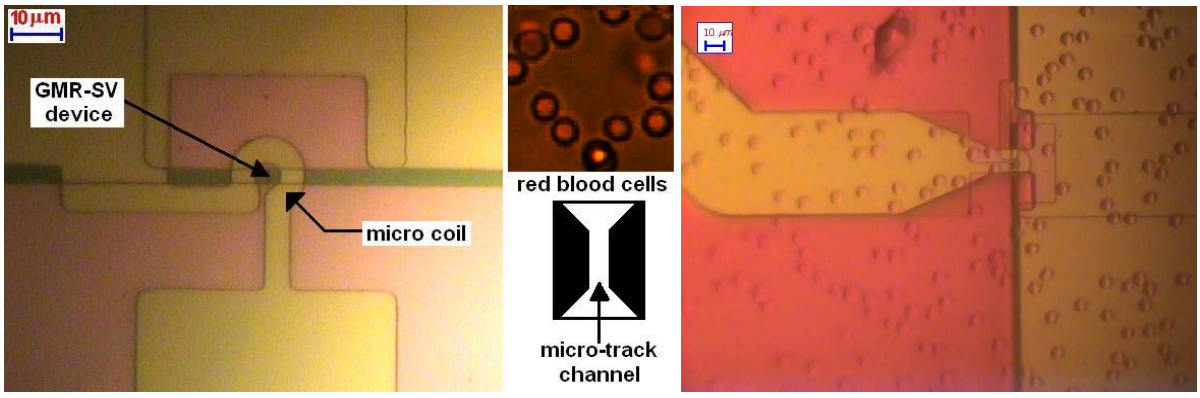


Fig. 1. Combination of GMR-SV device and one turn micro coil. RBCs flow through micro-track channel.

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[2] M. S. Markov and F. Pliquett, Bioelectrochemistry and Bioenergetics **14**, 495 (1985).