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Magneto-impedance based detection of magnetically labeled cancer cells and bio-proteins J. DEVKOTA, Department of Physics, University of South Florida, M. HOWELL, S. MOHAPATRA, Department of Molecular Medicines, University of South Florida, T.H. NHUNG, Institute of Physics, Vietnam Academy of Science and Technology, P. MUKHERJEE, H. SRIKANTH, M.H. PHAN, Department of Physics, University of South Florida — A magnetic biosensor with enhanced sensitivity and immobilized magnetic markers is essential for a reliable analysis of the presence of a biological entity in a fluid. Based on conventional approaches, however, it is quite challenging to create such a sensor. We report on a novel magnetic biosensor using the magneto-impedance (MI) effect of a Co-based amorphous ribbon with a microhole-patterned surface that fulfils these requirements. The sensor probe was fabricated by patterning four microholes, each of diameter 2 μm and depth 2 μm, on the ribbon surface using FIB lithography. The magnetically labeled Luis Lung Carcinoma (LLC) cancer cells and Bovine serum albumin (BSA) proteins were drop-casted on the ribbon surface, and MI was measured over 0.1 – 10 MHz frequency range. As the analytes were trapped into the microholes, their physical motion was minimized and interaction among the magnetic fields was strengthened, thus yielding a more reliable and sensitive detection of the biological entities. The presence of magnetically labeled LLC cells ($8.25\text{x}10^5$ cells/ml, 10 μl) and BSA proteins ($2\text{x}10^{11}$ particles/ml, 10 μl) were found to result in a $\sim 2\%$ change in MI with respect to the reference signal.

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