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A highly sensitive magnetic biosensor for detection and quantification of anticancer drugs tagged to superparamagnetic nanoparticles[1] J. WINGO, J. DEVKOTA, University of South Florida, T.T.T. MAI, X.P. NGUYEN, Vietnam Academy of Science and Technology, P. MUKHERJEE, H. SRIKANTH, M.H. PHAN, University of South Florida, UNIVERSITY OF SOUTH FLORIDA TEAM, VIETNAM ACADEMY OF SCIENCE AND TECHNOLOGY COLLABORATION — A precise detection of low concentrations of biomolecules attached to magnetic nanoparticles in complex biological systems is a challenging task and requires biosensors with improved sensitivity. Here, we present a highly sensitive magnetic biosensor based on the magneto-reactance (MX) effect of a $Co_{65}Fe_4Ni_2Si_{15}B_{14}$ amorphous ribbon with nanohole-patterned surface for detection and quantification of anticancer drugs (Curcumin) tagged to Fe_3O_4 nanoparticles. The detection and quantification of Curcumin were assessed by the change in MX of the ribbon subject to varying concentrations of the functionalized Fe_3O_4 nanoparticles. A high capacity of the MX-based biosensor in quantitative analysis of the nanoparticles was achieved in the range of 0 - 50 ng/ml, beyond which the detection sensitivity (η) remained unchanged. The η of the biosensor reached an extremely high value of 30%, which is about 4-5 times higher than that of a magneto-impedance (MI) based biosensor. This biosensor is well suited for detection of low-concentration magnetic biomarkers in biological systems.

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