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Mojtaba Shamsipur^a*, Mahdi Emami^b, Leila Farzin^c, Reza Saber^d

ABSTRACT

The sensitive quantification of Human Epidermal growth factor Receptor 2 (HER2), as a key prognostic tumor marker, plays a critical role in screening, early diagnosis and management of breast cancer. This paper describes a sandwich-type immunoassay with silver signal enhancement strategy for highly sensitive detection of HER2. For this purpose, the target capturing step was designed by functionalization of 3-aminopropyltrimethoxysilane coated magnetite nanoparticles with antibody (antiHER2/APTMS-Fe₃O₄), as a platform bioconjugate (PB), and immobilized at a bare GCE. Then, in the presence of label-free immunosensor, the PB was covered by magnetic gold nanoparticles self-assembled with thiolated antibodies (antiHER2/Hyd@AuNPs-APTMS-Fe₃O₄) containing chemically reduced silver ions, as a label bioconjugate (LB). Under optimum conditions, a linear relationship between the differential pulse voltammetric (DPV) stripping signal of silver and the logarithm of HER2 concentrations was obtained in the range of 5.0×10⁻⁴-50.0 ng mL⁻¹ $(R^2=0.9906)$ with a detection limit of 2.0×10^{-5} ng mL⁻¹. The effectiveness of this protocol was evaluated experimentally through employing of designed immunosensor for detection of the serum level of tumor marker. The good consistency of the results with those obtained by the enzyme-linked immunosorbent assay (ELISA) conventional method (p-value of <0.05)

^a Department of Chemistry, Razi University, Kermanshah, Iran

^b School of Chemistry, University College of Science, University of Tehran, Tehran, Iran

^c Radiation Application Research School, Nuclear Science and Technology Research Institute, Tehran, Iran

^d Department of Nanotechnology, School of Advanced Technologies in Medicine, Tehran University of Medical Science, Tehran, Iran

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