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PII: S0039-9140(18)30499-5
DOI: https://doi.org/10.1016/j.talanta.2018.05.033
Reference: TAL18673

To appear in: *Talanta*

Received date: 13 July 2017
Revised date: 28 April 2018
Accepted date: 8 May 2018

Cite this article as: Xiaoying Wang, Yijie Wang, Yanqun Shan, Meng Jiang, Miao Gong, Xin Jin, Xiaoning Wang and Jie Cheng, An electrochemiluminescence biosensor for detection of CdkN2A/p16 anti-oncogene based on functional electrospun nanofibers and core-shell luminescent composite nanoparticles, *Talanta,* https://doi.org/10.1016/j.talanta.2018.05.033

An electrochemiluminescence biosensor for detection of CdkN2A/p16 anti-oncogene based on functional electrospun nanofibers and core-shell luminescent composite nanoparticles

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Abstract An electrochemiluminescence (ECL) biosensor based on functional electrospun nanofibers for hybridization detection of specific CdkN2A/p16 anti-oncogene at trace level *via* binding luminescent composite nanoparticles for signal amplification has been developed. The carboxylated multiwalled carbon nanotubes (MWCNTs) doped polycaprolactam 6 (PA6) electrospun nanofibers (PA6-MWCNTs) was prepared *via* electrospinning, which served as the nanosized backbones for silica nanoparticles (SiO_2) electrodeposition. The functional electrospun nanofibers (PA6-MWCNTs-SiO_2) used as supporting scaffolds for single-stranded DNA1 (ssDNA1) immobilization can dramatically increase the amount of DNA attachment and the sensitivity of hybridization. The sandwich construction of ssDNA1-CdkN2A/p16 anti-oncogene -tri(2,2'-bipyridyl)ruthenium(II) ($Ru(bpy)_3^{2+}$)/silver nanoparticles (AgNPs) doped gold (Au) core-shell luminescent composite nanoparticles (RuAg@AuNPs)-labeled ssDNA2 (RuAg@Au-ssDNA2) was fabricated through a hybridization reaction. It was observed that high amount of doped $Ru(bpy)_3^{2+}$ in RuAg@AuNPs successfully amplify the recognition signal by adding tripropylamine (TPrA). The change of ECL intensity was found to have a linear relationship in respect to the logarithm of the CdkN2A/p16 anti-oncogene concentrations in the wide range of 1.0×10^{-15}~1.0×10^{-12} M, with a detection limit of 0.5 fM (S/N=3) which is