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A novel and sensitive electrogenerated chemiluminescence biosensor for detection of p16^{INK4a} gene based on the functional paste-like nanofibers composites-modified screen-printed carbon electrode

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Abstract In this work, we offered a novel and sensitive electrogenerated chemiluminescence (ECL) biosensing system for detection of p16^{INK4a} gene using the functional paste-like nanofibers composites-modified screen-printed carbon electrode (SPCE). The paste-like nanofibers composites (PG/GR/CS) which were comprised of the electrospun nanofibers (PG, the graphene (GR) doped polycaprolactam 6 (PA6) were prepared *via* one-step electrospinning), graphene (GR) and chitosan (CS) were served as the nanosized backbones for pyrrole (Py) electropolymerization. The functional paste-like nanofibers composites (PG/GR/CS/PPy) used as a substrate for dsDNA (hybridization reaction of ssDNA1, p16^{INK4a} gene and the $Ru(bpy)_3^{2+}$/silver nanoparticles (AgNPs) doped gold (Au) core-shell luminescent composite nanoparticles labled ssDNA2 (RuAg@AuNPs-ssDNA2)) immobilization. Under optimal conditions, a linear relationship between ECL intensity and p16^{INK4a} gene concentration was found in a range of 0.1 pM ~ 1 nM with the detection limit of 0.05 pM (S/N = 3). This ECL biosensor based on the PG/GR/CS/PPy-modified SPCE demonstrated excellent electrochemical performance for the detection of p16^{INK4a} gene and this platform can be used for the determination of various analytes.

Keywords electrogenerated chemiluminescence biosensor, functional paste-like nanofibers composites, screen-printed carbon electrode, p16^{INK4a} gene

1. Introduction

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