

Electrochemiluminescent Detection of DNA Damage Induced by Tetrachloro-1,4- Benzoquinone Using DNA Sensor

Authors : Tian-Fang Kang, Xue Sun

Abstract : DNA damage induced by tetrachloro-1,4-benzoquinone (TCBQ), a reactive metabolite of pentachloro-phenol (PCP), was investigated using a glassy carbon electrode (GCE) modified with calf thymus double-stranded DNA (ds-DNA) in this work. DNA modified films were constructed by layer-by-layer adsorption of polycationic poly(diallyldimethyl- ammonium chloride) (PDDA) and negatively charged ds-DNA on the surface of a glassy carbon electrode. The DNA intercalator [Ru(bpy)₂(dppz)]²⁺ (bpy=2, 2'-bipyridine, dppz=2,6-dipyrido [3, 2-a: 2',3'-c] phenazine) was chosen as an electrochemical probe to detect DNA damage. After the sensor was incubated in 0.1 M pH 7.3 phosphate buffer solution (PBS) for 30min, the intact PDDA/DNA film produced a sensitive electrochemiluminescent (ECL) signal. However, after the sensor was incubated in 100 μM TCBQ or a mixed solution of 100 μM TCBQ and 2 mM H₂O₂, ECL signal decreased significantly. During the incubation of DNA in TCBQ or TCBQ-H₂O₂ solution, the double-helix of DNA was damaged, which resulted in the decrease of Ru-dppz bound to DNA. Additionally, the results were verified independently by fluorescence experiments. This paper provides a sensitive method to directly screen DNA damage induced by chemicals in the environment.

Keywords : DNA damage, detection, electrochemiluminescence, sensor

Conference Title : ICEES 2015 : International Conference on Environmental and Earth Sciences

Conference Location : Venice, Italy

Conference Dates : April 13-14, 2015