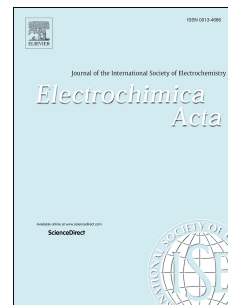


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Toehold-mediated strand displacement reaction triggered by nicked DNAzymes substrate for amplified electrochemical detection of lead ion

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4
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9
10 **Abstract:** Searching for a sensitive analytical method for the detection of lead ion
11 (Pb^{2+}) without involving any enzymes is of great significance in environmental
12 monitoring. Herein, based on the integration of toehold-mediated strand displacement
13 reaction (TSDR) and the electrocatalysis of magnetic Fe_3O_4 toward electron mediator
14 methylene blue (MB) for signal amplification, a sensitive electrochemical biosensor
15 for Pb^{2+} was developed by using Pb^{2+} -specific DNazymes as recognition probe. The
16 electrode surface was firstly modified with Au nanoparticles (AuNPs)-loaded Fe_3O_4
17 nanocomposites ($\text{AuNPs@Fe}_3\text{O}_4$) and a DNA duplex containing the capture probe
18 ($\text{NH}_2\text{-CP}$) with two specific toehold sequences. Fuelled by the cleaved substrate
19 fragments (rSS) of Pb^{2+} -specific DNazymes, TSDR was activated to allow for the
20 complete assembly of MB-labelled signal probe (MB-SP) through the hybridization
21 with $\text{NH}_2\text{-CP}$, resulting in the spatial proximity of MB close to Fe_3O_4 in the modified

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