

The application of iron(III) complexing with different forms of DNA for the development of the biosensor for blood serum assay

Babkina S., Ulakhovich N.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Fe(III) complexing with DNA was studied using spectrophotometric and voltamperometric data and mathematic simulation as well. The binding constant for the hypothetical complex Fe(III)-DNA 1:1 was $1.4 \times 10^{-3} \text{ mol}^{-1}$. Fe(III) complexes with various forms of DNA were characterized in terms of their composition and binding constants. The complex composition for the immobilized denatured DNA (d-IDNA) was found to be 1:2.25 (nucleotide:Fe(III)); this complex was characterized by the highest value of binding constant. d-IDNA was included into an amperometric biosensor for assay of Fe(III) content in human blood serum. The method of Fe(III) selective determination in the form of the complexonate was elaborated with the lower limit of detection of $1 \times 10^{-7} \text{ mol} \cdot \text{l}^{-1}$. The linear region of Fe(III) detection was within the following concentration range $1.0 \times 10^{-7} - 6.0 \times 10^{-5} \text{ mol} \cdot \text{l}^{-1}$. Determination of Fe(III) in the presence of matrix blood serum ions such as Mg(II), Zn(II), Cu(II) and Al(III) was carried out. The proposed method is well reproducible, characterised with an easy sampling and speed.

Keywords

Biosensor, Blood serum assay, DNA, Iron complexes