Switch of guanine and adenine current caused by temperature change in DNA/NIPA and PAM-based hydrogels

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Combination of hydrogel lattices with oligonucleotides gives a possibility to associate unique properties of each constituent. [1,2]

In this work, for first time we report on changes in electroactive and conductive properties of the composite materials related to structural changes of single- (ssDNA) and double stranded (dsDNA) oligonucleotides introduced noncovalently into PAM and NIPA hydrogels. Both effects were measured in the temperature range below the temperature of denaturation process of oligonucleotides. Investigations were focused on electrooxidation process of particular nucleic-acid bases via cyclic- and square wave voltammetry.

We present an effective way of noncovalent introducing of anionic ss- and dsDNA during the free radical polymerization process of hydrogel-based lattices. dsDNA maintained its native and fibrous forms. The adsorptive effects and the mechanism of reactions occurring during the electrooxidation process in the composite lattices under particular environmental conditions are discussed. As well, the swelling, sorption and releasing properties of selected intercalators/drugs were investigated. We discussed the phase transition effect, the interaction with the lattice and the release processes of intercalators that occurred during the electrooxidation. Also, we studied the conductivity properties of the composite lattices measured by using electrochemical impedance spectroscopy. For this purpose the electrochemical transfer resistance of an external electroactive $Fe(CN)_6^{3-/4-}$ redox couple, as well as the electrooxidation current of particular acid bases of entrapped oligonucleotides were determined. We analyzed the influence of the Maxwell-Wagner effect in the low ionic strength conditions on electron transfer resistance occurring during the electrooxidation of entrapped oligonucleotides. All results of the investigations were compared with those were particular oligonucleotides were present in an aqueous solution. [3,4,5]

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