

几种表面活性剂与DNA的相互作用

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摘要 用循环伏安、紫外-可见光谱和交流阻抗等方法,以电活性小分子亚甲基蓝(MB)为探针,研究了多种表面活性剂与DNA的相互作用。研究发现,阴离子、阳离子和非离子表面活性剂均可通过疏水和静电作用与固定在电极表面的DNA分子结合,改变电极表面DNA的状态,进而影响电活性小分子的电化学反应。阴离子表面活性剂与DNA之间以静电排斥为主,也有部分疏水性结合,它使MB的氧化还原峰电流减小。阳离子表面活性剂十六烷基三甲基溴化铵、十二烷基三甲基氯化铵均在一定浓度范围内对MB的电化学响应有增敏作用,而代十六烷基吡啶、溴代十八烷基吡啶表现出抑制效应,它们与DNA间既有疏水性作用,也有静电吸引。非离子表面活性剂与DNA的结合较弱,其主要是通过改变溶液的性质(如粘度、极性和介电常数等)影响DNA的构象,从而导致MB电化学参数的微弱变化。此外,表面活性剂疏水链的长短及极性头基的大小对作用过程也有一定影响。

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Electrochemical Study on the Interaction of DNA with Several Surfactants

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Abstract The interaction of DNA with several surfactants was investigated by cyclic voltammetry, UV-vis spectrum and ac impedance, using MB as the redox probe. It was found that all anionic, cationic and non-ionic surfactants can bind to DNA immobilized on the electrode surface, changing the surface state of DNA, thus affects the electrostatic behavior of the probe. The interaction between DNA and anionic surfactants is attributed to electrostatic repulsion and hydrophobic binding, which makes the peak current of MB decrease. Non-ionic surfactants bind to DNA weakly, but they can partly change the conformation of surface DNA because they changed the solution properties. While cationic surfactants bind to DNA via hydrophobic interaction and electrostatic attraction. This interaction is influenced by the length of the hydrophobic carbon chain and the size of the polar headgroup of cationic surfactants. Among them, cetyltrimethylammonium bromide and dodecyltrimethylammonium chloride can improve the electrochemical response of the probe in certain concentration range, while cetylpyridinium bromide and octadecyltrimethylammonium bromide depress the probe's response.

Key words [INTERACTIONS](#) [DEOXYRIBONUCLEIC ACID](#) [SURFACTANTS](#) [GOLD](#) [ELECTRODE](#) [ELECTROCHEMISTRY](#) [ULTRAVIOLET SPECTROSCOPY](#)

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