

Using of chemical sensors for rapid diagnostic tests of exhaled air

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Abstract

The analysis of exhaled air on specific biomarkers content is one of the most promising and at the same time simplest methods of early disease detection. In the present paper the analysis of this issue has been performed on an example of diagnosis of some the most dangerous diseases, based on available literature. The relevance of research on application of new diagnostic methods, namely rapid diagnostic tests using chemical sensors, is shown in this work. The main disadvantages of modern medical diagnostics in comparison with advantages of solid-state chemical detectors application have been shown. General details about traditional methods of exhaled air analysis have been provided. The characteristic of chemical sensors and principle of their work was outlined. The main part of the literature review contains the results of the diseases diagnosis by analyzing expired air of people who suffer with diabetes mellitus, tuberculosis and cancer. Chemical sensors or devices based on them, such as an electronic nose, served as control instruments. The review presents identifiable and potential biomarkers for these diseases. So as a rule, acetone vapour is selected as a biomarker of diabetes. At the same time, the choice of biomarkers for most of oncological diseases still remains a serious problem. Despite this, high results of analysis on the sensitivity and specificity of the used sensor devices to the diseases under consideration were noted in many cases compared with people in the control groups. Also the materials used for the manufacture of sensor elements and their design characteristics have been considered in the review. Doped metal oxides, quartz resonators covered with special coatings, nanomaterials based on gold particles and carbon nanotubes are most often used for the producing of sensor elements. The obtained research data indicate that the research area under consideration is promising, and widespread introduction of non-invasive express diagnostics in medical practice can be expected in the near future.

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