

SUMMARY

The dissertation covers the problem of application of multi-sensor arrays as tools for rapid detection and classification of microbial infestations of buildings.

The dissertation consists of 5 chapters. The theoretical part of the dissertation discusses the problem of sick building syndrome and also mycological infestation of buildings. Then the harmful compounds produced by fungi and sources of microbial corrosion are presented, as well as the scale and scope of the fungal problem. Methods for assessing mycological infestation are also described, including microbiological methods, chemical methods and multi-sensor matrices. The last part of this chapter focuses on statistical data processing methods used as a tool for analyzing the signal from multi-sensor matrices.

In the following section, the research methodology is presented, including the objects studied in this work along with the assessment of the degree of microbial infestation, as well as the research methods used in performing the analyses in this dissertation. The configurations of the multi-sensor arrays used are characterized in detail, along with a description of the sensors.

The equipment of the test stand at each type of study is also described, and the method of collecting air samples in the studied facilities is presented, along with the preparation of the medium for incubating fungal colonies from the collected air samples. The chapter also includes the methodology of parallel chromatographic studies of selected harmful chemical compounds emitted by fungi, along with the procedure for preparing carbon fibres, for microextraction, used for analysis. In addition, microbiological tests of the obtained fungal colonies and determination of the number of CFU were performed.

The third chapter describes the results obtained from microbiological through chromatographic tests to the results obtained with multi-sensor matrices. Both the results of PCA analyses with multiple regression models and artificial intelligence models such as SVM and MLP are presented here. The chapter is divided into sections describing results obtained from real objects and from cultures.

The whole work is closed with a discussion of the results with reference to the purpose of the work and also a summary and conclusions. As a result of the study, it was proved that it is possible to detect the state of microbial infestation of a building as well as to replace the traditional microbiological and chemical methods with rapid detection methods in the case of screening or the need to measure a large number of objects. In the case of the examination of samples taken from these objects, the coefficients of determination R^2 between the value estimated past the matrix and the actual value of the concentrations of the analysed substances were as follows: PCA 0.3862; SVM 0.995; MLP 0.815. Both MOS and EC sensor arrays can be used for this purpose.

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