

NON-CONTACT METHODS FOR MONITORING OF AQUATIC ENVIRONMENT

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Abstract

Nowadays, the problem of environmental pollution, in particular water bodies, is an urgent problem. According to this, new methods of ecological monitoring of water bodies are being actively developed. But most of them are based on remote monitoring of large areas of open water surfaces. However, due to the almost total obstruction of a large number of places on the coast because of the dense vegetation there — not all of these methods might be efficient enough. In such conditions, the most effective method is hand sampling. Nevertheless, the possibilities of this approach are greatly limited by the number of samples taken and their further logistics.

Therefore, it is important that basic information on the state of the water samples is available immediately at the sampling site, and only suspicious samples are sent to stationary laboratories for deeper studying. One of the methods that allows you to quickly get information about a sample state and take action as fast as possible is control in an express mode. Chemical and optical methods are usually used for control in an express mode. However, both of them have certain disadvantages. One of the possible solutions to this problem is the compact nuclear magnetic spectrometer developed in our laboratory. The only thing necessary for its operation is the presence of particles with nonzero magnetic moments. This requirement is always satisfied in the researches of water bodies, because water contains protons with the greatest magnetic moment. It is also worth noting that research using nuclear magnetic resonance is non-destructive.

The state of the medium can be determined using the measured values of the relaxation constants T_1 and T_2 . If the measured values differ from the values corresponding to the standard state of the medium, impurities may be present in the medium and in this case additional study of the medium is necessary. In addition, in a small-sized nuclear magnetic spectrometer, we have implemented the ability to register a signal not only from protons, but also from some other nuclei. This allows in some cases at the site of sampling to establish the cause of the deviation in the medium (to classify the impurity). It is very important for decision-making about the use of this medium.

Keywords: nuclear magnetic resonance, express control, spectrum, medium state.