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APPLICATION OF CHEMICAL TEST METHODS FOR DETERMINATION ANALYSIS OF HEAVY METAL IONS TOTAL CONTENT IN WATER

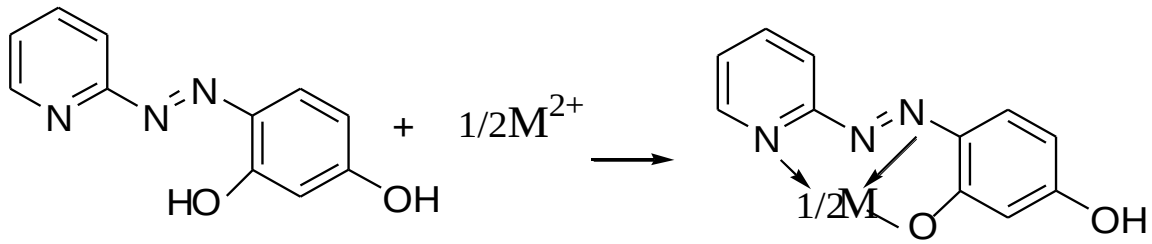
Man-caused load on the environment grows every year. One of the factors of such load is the increase in the number of domestic and industrial emissions that require their disposal. Industrial emissions include emissions from thermal power plants and various industrial enterprises. Heavy metals are especially dangerous andthey negatively impact the ecological system of reservoirs. They can be found in the wastewater of metallurgical and metalworking enterprises, galvanic shops, car companies. No matter how perfect the wastewater treatment is, a significant amount of heavy metals enters the environment.

Heavy metals are a vague group of elements with metallic properties. This group usually includes transition metals, some metalloids, lanthanides and actinides. The term “heavy metals” is used for the following elements: chromium, cobalt, nickel, copper, zinc, arsenic, selenium, silver, cadmium, antimony, mercury, thallium and lead. The environment is polluted mainly by the following metals: Cu, Fe, Pb, Cr, Zn, Cd.

Recently, there has been a tendency to analyze environmental objects in the field, that is, in the place where the object of analysis is located, and not in a stationary laboratory.

Chemical and biochemical test agents are very important for non-laboratory analysis. They are simpler and cheaper compared to mini-analyzers. Paper strips, films, indicator tubes, tablets, ampoules and other chemical analysis test instruments are becoming more and more widely used. Most test determinations are based on chemical reactions that occur on the surface of various sorbents and are accompanied by an effect that is easy to detect, such as the appearance of color or discoloration. Test analysis has many advantages: it saves time and money on the delivery of samples to the laboratory and the laboratory analysis itself reduces the requirements for the qualification of the performer.

Therefore, the reactions of heavy metals with 4-(2-pyridylazo)-resorcinol or 1-(2-pyridylazo)-2-naphtholimmobilized on a film with different sorbentsare usedto determine the total content of heavy metal ions in water. Thus, stable and accurate results are given by the method based on the reaction of complexation of metals (cobalt (II), cadmium (II), copper (II), zinc (II), nickel (II), lead (II)) with 4- (2-pyridylazo)-resorcinol (surfactant) which is immobilized in a gelatin film. The reactionbetween metal ions and surfactants can be represented as:



The same reaction can be carried out between metal ions and surfactants immobilized on the sorbent in the presence of nonionic surfactants Triton X-100 which is added to improve the wetting of the sorbent surface.

Another method of determination is based on the formation of red metal ions complexes in the alkaline environment with 1-(2-pyridylazo)-2-naphthol immobilized on paper. In this case, a color scale is obtained, which allows determining the total concentration of heavy metal ions in the control solution.

After test research it is necessary to evaluate metrological characteristics of visual analysis methods. To estimate the limit of determination (C_{lim}) using a color scale, it is necessary to experimentally find the standard deviation of the determination analysis with the concentration close to C_{lim} (S_c). The triple value of the standard deviation ($3S_c$) is taken as the final estimate. Based on this estimate, a conclusion is made about the total content of heavy metal ions in the solution.

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