PECULIARITIES OF BEHAVIOR OF MACROHETEROGENEITY PARAMETER OF ELEMENTS IN HETEROGENEOUS ALLOYS AND NEW TECHNOLOGIES IN ATOMIC EMISSION SPECTROSCOPY

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Key words: atomic emission spectroscopy, liquated heterogeneity, F-parameter, homogenizing, prediction of mechanical properties, structure characterization of alloys.

The presence of crystalline structure defects, in particularly the liquated heterogeneity, is one of causes of reduction of precision of spectral analysis, decrease of mechanical properties, and increase of error of determination of heat treatment parameters of crystalline alloys. In order to control with this imperfection it is necessary to examine the behavior of the liquated heterogeneity. Peculiarities of behavior of macroheterogeneity parameter of elements in heterogeneous alloys are established. They are developed through the wave character, the expressiveness of its, and the dependence of the F-parameter on the quantity of brittle structural constituents (BSC), causing the decrease of mechanical properties. It is developed new technologies in the atomic emission spectroscopy (AES), due to found properties of the F-parameter. It is proposed the use of manner of the predicted liquation control for the elimination of heterogeneity of chemical composition of alloys. It is found that the precision of determination of the heating time at the homogenizing of alloys is increased as much as 3 times in comparison with Shewmon solution of the diffusion problem. The structure characterization of alloys may be realized by the AES measurement of the F-parameter and with following utilization of the empirical model $F = f(K)$, where the $K$ is the volumetric portion of structural constituents. AES method is proposed for the prediction of mechanical properties of alloys, caused by presence of the BSC on the interface. The empirical models are the adequate to results of direct experiments. The productivity of the inspection process is increased as much as 2.6 times in comparison with basic micro- X-ray spectroscopy because of absence of operation of polishing of the sample. The spectral approach is favored when it is necessary to obtain the structure characterization and the prediction of mechanical properties of materials, distinguishing with labor-consuming mechanical treatment.

CONCENTRATION AND DETERMINATION OF COBALT IN WATERS USING A SILICA ABSORBENT WITH GRAFTED TRIPHENILPHOSPHONIUM GROUPS

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Key words: cobalt, silica gel with triphenylphosphonium groups, sorption-spectroscopic and visible-test methods.

Sorption is a modern method of pretreatment sample preparation used to analyze heavy metal content in water, in particular, the content of cobalt. The method guarantees effective
concentration of metal trace quantities of metals, as it allows reaching high concentration factors. Sorbents with high sorbing and kinetic properties, such as silica gels with different embedded different functional groups, are widely used in this technique.

The study looks into cobalt (II) sorption with a sorbent with triphenylphosphonium groups chemically fixed on a surface of silica gel (TFFS), performed in static mode. The conditions of quantitative extraction of cobalt from weak solutions, such as the acidity of aqueous phase, the quantity of the sorbent, the first passage time of the extraction factor, were examined. It was established that cobalt is sorbed on the TFFS sorbent at 5 %. The quantitative extraction of the metal is possible only after a padding ligand – Nitroso-R- salt (NRS) is introduced into the solution. In this case cobalt sorption reaches 98 % at pH ≥7.0–8.5.

The sorption follows an anion exchange mechanism. Complex formation on a surface is characterized by formation of the colored complex with bands in a diffuse reflection spectrum at 417 and 520 nm, which mostly coincide with absorption spectrum maximums of the complex in aqueous solution. It was established with the help of saturation method that a cobalt complex with NRS is formed on a surface of TFFS sorbent at the ratio of 1:3.

Cobalt sorbed in the presence NRS on the surface of TFFS sorbent was determined directly in solid spectroscopically (diffuse reflection) or visually. The concentration factor is peer 500 ml/g, the limit of the determination contents of cobalt makes 3 microgram per liter. Sorbing-spectroscopic and visual techniques for cobalt determination in various water categories were developed on the basis of the research results.

ELECTROMECHANICAL FAILURE OF ELECTRODES IN SPECTRAL SOURCES OF LIGHT

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Key words: spectral sources, electromechanical character of spark erosion, thermal shock.

The study of laws of the electrical mechanical erosion presents the interest as for the case of electrical spark alloying as in a practice of spectral analysis of alloys, distinguishing with the brittle failure. The electromechanical failure of electrodes in the spectral spark sources of the light in air environment is presented. The rise of the volumetric electrical spark erosion rate of refractory metals, rustles steels, boron-containing and tungsten-containing alloys and brittle structural constituents at the decreasing of their mechanical properties is established. These results are given for the high -voltage condensed spark (HCS). The pulse duration of HCS was approximately 7.56 Mks. They testify, that surface layers of electrodes are subjected to mechanical influences, besides the thermal loading. As to low-voltage spark discharge with the pulse duration, equaled to 0.5 Mks, the torch mechanism of the electrical erosion intensifies the mechanical failure of the BSC. Results of the dispersion analysis show the predominance of electromechanical character of the spark erosion. It is calculated that the influence of plane source of the heat on the surface of alloys promotes to large gradient of temperatures. It makes up 2·10^6 grad/cm on the depth of the single crater. Namely, it is taken place the typical accident of the thermal shock. So, at the ionic bombardment the electromechanical character of spark erosion of alloys, distinguishing the brittle failure, can be explained with the thermal shock. Apparently, at the influence of the thermal shock the separation of ultimate particles takes place as a result of brittle failure of the brittle structural constituents, such as borides of iron, before of their melting. Then they are transported by the shock wave in the column of the discharge.