

## ELECTRICAL FIELDS AND DISCHARGES IN PROCESSES OF SEWAGE PURIFICATION

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In the paper the results of researches processes of complex purification of sewage with application of electrical discharge effect. It is shown that application of electrical discharge barrier type and ozonizing significantly raises the efficiency of adsorptive clearing of sewage from impurities. Offered method represents the very promising purification technology for industries' sewage.

In conditions of a snowballing of various industries problems of water reclamation as means of conservation of water resources, sewage purification and ordering of water consumption at the factories are actual for today and demand the urgent solution. Sewage of the various industrial factories contain suspended matters in the composition - calcium, magnesium, sodium+kalium, hydro carbonates, carbonates, sulfates, chlorides, ammonia (on nitrogen), nitrates, nitrites, phosphorus, mineral oil, organic compounds (including phenol), ions of metals, salts of barium, bismuth, strontium, iron, zinc, aluminum, titanium, kalium. In some events sewage appear is radioactive infected, contain in the composition heavy atoms of iodine and other impurities which getting as the waste in reservoirs or ground, pollute them and intoxicates living and vegetable organisms.

Presence of an affluent spectrum of impurities in sewage demands development of qualitatively new purification processes providing hard ecological requirements.

Most of cleaning technique of waste waters now is are periodic, multiphase processes having series of an essential limitation. The basic key defect existing methods is that with the purposes of clearing waste water from admixtures there are used the contact them to acids, alkali and other reagents that clears water from admixtures, but at the same time remain in water and by that negatively effects on a nature.

From put into practice cleaning technique of waste waters the adsorptive methods with use of solid natural adsorbents, have some advantages [1]. The adsorptive processes taking place at contacting a liquid with solid surface are widely used in a chemical industry and other branches of engineering. Availability of the adsorptive method, requirement of practice demand study of possibilities of the further application of the adsorptive processes, developing of control facilities by them during carrying out of processing steps.

One of such control facilities is influence of electric fields and discharges on the adsorptive process [2-4]. Effectiveness of influence electric discharge on sorption processes is determined not only a possibility of control but also other advantages of electrical influence: a possibility of direct effect in passing sorption process, small power consumption and manufacturability.

In the present work results of researches on sewage purification on the plastic manufacturing plant, the thermal electric station and gas processing factory and oil seam waters are given.

The combined physicochemical methods of purification including reagent and adsorptive purifications at action of the ozone, the strong electric fields and discharges were used in processes [5].

Experiments were carried out on samples of water, both taken immediately from a concrete industrial installation and synthetically prepared in laboratory conditions.

Let's consider results on reagent purification of water from salts of hardness in conditions of action of electric discharge of barrier type. The offered purification method is carried out as follows.

The water containing salts of hardness was treated by mixture consisting of 97 % weight Silicate of alkali metal, 0,6 % weight Alcohol and 2,4 % weight Calcium chloride at envioning temperature, and before compounding silicate of alkali metal was exposed by electric discharge.

Action of electric discharge was carried out in the glass pot with the built - in electrode system formed the configuration of weak non-uniform electric field with dielectric barriers in an interelectrode interval. At the application to electrode system the sufficient value of alternating voltage there was an electric discharge of barrier type in the interelectrode interval. Silicate of alkali metal was passed with fixed velocity through an interelectrode interval in which the discharge was initiated. Laboratory experiments have shown that action of electric discharge during even 30 seconds apparently increases effect of water purification by silicate of alkali metal. Therefore for optimization of process the reagent was exposed the discharge within (1-5) minutes. After treatment the water is fed on settling. The allocated sediment as gel was separated from solution by centrifugation.

Purified water can be used in the industrial and technical purposes in a cycle of self-contained water service, and the sediment can be used for preparation the construction materials or fertilizing, or for the further processing. Action of electric discharge on the mixture's basic component - silicate of alkali metal, considerably activates it that results in increasing of water purification velocity. As a result of faster sedimentation of salts of hardness the productivity of process increases.

Besides the activation of silicate of alkali metal causes smaller specific expenses of the reagent that results both in reduction in price of purification process, and to absence or sharp decreases of reagent traces in water.

The mixture of composition, weight, treated the initial water with hardness, equal 200 mg.equ/l, incorporating the salts of barium, bismuth, strontium, iron, zinc, aluminum, titanium and kalium. %:

Silicate of sodium - 97

Alcohol - 0,6

Calcium chloride - 2,4

The mixture is introduced as 1,5 % of water solution. Thus silicate of sodium is not exposed to electric discharge.

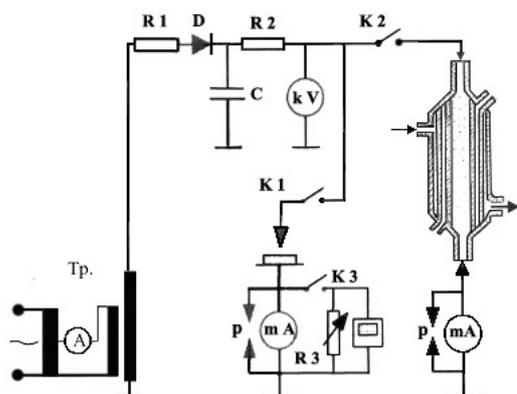


Fig. Principal electric scheme of discharge action at clearing process

The charge of mixture makes  $70 \text{ g} / \text{m}^3$ . The processed water settled within 1,5 hours, then the allocated sediment was separated by centrifugation. As has shown analysis, purified water has zero hardness. In the following experiment, saving identical all requirements of experiment, before compounding carried out action of electric discharge on silicate of sodium at the voltage between the electrodes of 16 kV (fig.). The average value of field intensity in a discharge gap of 4 mm was equal 40 kV/cm. Action of the discharge on a reagent carried out during 3 minutes. In the given experiment the charge of a mixture made  $50 \text{ g} / \text{m}^3$ , and the processed water was settled within 1 hour, then the sediment was separated. Purified water also had zero hardness.

From comparison of results it is visible, that action by electric discharge on silicate of sodium gives an opportunity to reduce the charge of a reagent and to reduce the

sedimentation time till 1 o'clock. The further experiments in this direction have shown, that the preliminary activation of silicate of alkali metal by means of electric discharge results in the considerable expansion of cleared impurities assortment in water, such, as mineral oil, organic compounds (including phenol), ions of metals.

In work researches of clearing processes with use of ozone actions are carried out. Results of researches have shown that ozone is effective at clearing of the various factories sewage from such bonds, as ethylene amine, ammonia, polyesters, sulfur-containing bonds, etc.

In an event of application of ozone during sewage clearing, besides a direct effect of a disinfecting of water, the positive side effect, the bound with sharp decrease of sedimentations on the walls of pipelines and reactors is observed still. Results of work can be the useful at polymeric materials manufacturing, for a wood pulp and paper industry, for the slate factories, in dyeing business, a dry-cleaner, etc. Ozonization is an efficient method of deodorization of water polluted by mineral oil. At ozonization of the water keeping mineral oil in concentration 1 mg/l, i.e. approximately in 10 times is higher than their threshold on an smell, the complete deodorization of water was observed as a result of 3-5 minute treatment by ozone dose of 3 mg/l.

By researches it fixed, that use of actions of electric discharges in various gaseous environments allows increasing efficiency of the adsorptive methods of sewage purification essentially.

In work as adsorbents Silica Gel of KCM mark, synthetic zeolites and natural zeolite of Ay-Dag deposits (Azerbaijan) were used.

On the basis of obtained results, in dependence on impurities composition of initial water, some alternatives of clearing processes that are successfully tested in laboratory conditions are offered. Some results have been tested and introduced in the relevant industrial factories.

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## TULLANTI SULARIN TƏMİZLƏNMƏSİ PROSESLƏRİNDƏ ELEKTRİK SAHƏLƏRİ VƏ BOŞALMALARININ TƏTBİQİ

Məqalədə elektrik boşalmalarının təsiri vasitəsilə tullantı suların adsorbsiya üsulu ilə təmizlənməsinin tədqiqindən əldə edilmiş nəticələr verilmişdir. Göstərilmişdir ki, arakəsməli elektrik qaz boşalmasının və ozonlaşmanın təsiri tullantı suların adsorbsiya üsulu ilə təmizlənməsinin effektivliyini nəzərə çarpacaq dərəcədə yüksəldir. Təklif olunan üsul sənaye tullantı suların təmizlənməsi texnologiyası üçün əhəmiyyət kəsb edir.

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**ЭЛЕКТРИЧЕСКИЕ ПОЛЯ И РАЗРЯДЫ В ПРОЦЕССАХ  
ОЧИСТКИ СТОЧНЫХ ВОД**

В статье приводятся результаты исследований процессов адсорбционной очистки промышленных сточных вод с использованием воздействия электрического разряда. Показано, что использование воздействия электрического разряда барьерного типа и озонирования значительно повышает эффективность адсорбционной очистки сточных вод от примесей. Предлагаемый метод представляет интерес для технологии очистки промышленных сточных вод.

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