THE CHARGED CONDITION IN ADSORBENTS

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Abstract
The charged condition in nonorganic adsorbents is researched. It is shown, that adsorbents efficient charging takes place at using the unipolar current pulses. The applicable of adsorbents previously treated by electrical field for radioactive waste utilization is revealed.

Introduction
Solid nonorganic porous adsorbents – silica gels and ceolits call to itself attention of specialists in different fields of activity. Analysis of publications only in recent years has reveal more than 300 names in different publishing. One of the actual directions is a processing of solid, liquid and combined adsorbents by means of electrical fields and discharges. Applicable to ceolits and silica gels it is known that absorption of electrical charges increases their adsorptivity, expressing in increasing a depth of adsorptive clearing of liquid and gaseous materials, increases electrical and mechanical strength of composite materials when using these adsorbents as fillers. It was suggested that reason of porous adsorbents adsorptivity increasing is a forming a charge condition revealed by the thermostimulation method [1,2].

Subject-matter
The fine – porous silica gel of KCM marks having the spherical forms by the size of 5-6 mms, and natural ceolit having the forms by the thickness of 3-6 mms were used in experiments. The samples was covered by graphite electrodes. The samples were clamped by metallic contacts according to usual scheme of electrets studying and were connected to the constant voltage from 1 V up to 200 V.
The time dependency of a sample current was obtained. The initial amplitude of current was up to 20 mA and form of current much powerfully depends on water contents in adsorbents. As more water the adsorbent contains that more the current value at a first moment and that more long occurs its reduction. At a first moment of the time, for the silica gel the current form is exponential, but at the approach to minimum value (several microamperes) – single-line. For ceolit the current form is also nonlinear and can be described by the fractional degrees multinomial. The residual current value is a few tens of microamperes. In given time intervals the samples were connected to the voltage again. In other variant of experience the

voltage has a square-wave pulses form. In these cases the currents initial value was far less and decreasing occurred quicker. At connecting to the voltage the previously charged and then short-circuited (for 5 hours) sample the initial currents amplitude is repeated.
The discharge characteristic of previously charged samples of silica gels and ceolits are investigated. The samples was short-circuited to resistor. The time dependencies of a voltage and current changing was obtained. Depending on resistor value the discharge graph form is changed from the line up to exponential curve. Depending on water and some other materials containing in adsorbents the initial voltage is changed from tens millivolts up to two volts, which does not depend on the charging voltage. Silica gel by the volume of 1 mm^3 is capable to accumulate a large charge which is saved long years without the essential reduction.
Carbon adsorbents containing the radioactive materials will easy return them together with carbon into previously charged silica gels and ceolits. Silica gels and ceolits received carbon are the most electrically active.
Possibility of anomalous absorbing the β particles by the silica gel [3] is researched. The objects polluted by radioactive materials was covered by layer of silica gel previously charged by means of corona discharge then daily the radioactive radiation level was measured. The initial material possessed radioactivity exceeding the background in ten time. After covering by a silica gel layer the radioactivity level on the surface of silica gel is reduced double. In a month the radioactivity is reached the steady-state at the background level.

Conclusion
For the adsorbents efficient charging it is necessary to use the unipolar current pulses which are to be high-frequency pulses appearing in particularly at different type of electrical discharges under the constant voltage. At such effect the ultimate value of charge absorbed by adsorbent is not install. At connecting to the constant voltage the current has a attenuated character.

Applicable to composite materials the treated dielectric fillers containing SiO_2 and structured water can solve the strength problem of composite materials. Adsorbents previously treated by electrical field can solve the radioactive waste utilization problem.

References

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