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ABOUT ENVIRONMENTAL CLEANNESS OF THERMAL ELECTRICAL PLANTS

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Abstract

Results of researches concerning the ecological problems of thermal electrical plants functioning are presented. It is shown that treatment of adsorbents by electrical discharges sufficiently improves the adsorption cleaning of fuel burning products.

Introduction

The problem of maintenance an environmental cleanness of thermal electrical plants is caused by the following situations. According to international expert estimations the gases discharged at combustion the fuels of mineral kinds (solid, liquid, gaseous), destroy an environment.
On the other hand, the manufacturing for 80 % is provided via burning of a mineral fuel. It causes needs for creation of technologies, providing the nonpolluting functioning of thermal electrical plants. The large volumes of discharges of thermal electrical plants cause necessity of searches and application the nontraditional methods of clearing.
Earlier in our works researches of influence of strong electric fields and discharges on adsorption processes on a surface of solid bodies have been carried experimentally out [1]. The technique developed in works has allowed establishing experimentally the fact of an intensification of adsorption processes. Quantitative characteristics of process and the basic mechanisms having a place at sorption stimulation by electric fields and discharges have been established. Researches of the mechanism of intensifying influence of the electric discharge on the sorption have shown that an essential role in this process plays the charging of adsorbent.
Technical problems for which use of the electric discharges in sorption process is the most effective are revealed. Opportunities are revealed and purposeful influence of the electric discharges on sorption process is carried out at use for the various technological purposes. Qualitatively new adsorptive method clearing of industrial hydrocarbon liquids from impurity with use of influences of electric discharges is developed [2,3].
The further researches have shown perspectives of searches updating of clearing methods using the strong electric fields and discharges. Applicability of the developed technique for clearing of impurity not only liquid materials, but also gaseous, such as carbon dioxide, sulfur dioxide, and also strongly viscous fuel liquid - black oil has come to light.
In this work the results of researches spent by us on the given problem are presented. The spent works include:

- activation and modifying of a adsorbents' surface by effects of electrical discharges;
- control of the sorption processes;
- increase of the rate of gases and liquids clearing by using the adsorbent and reactant activation.

The work description

Research on sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) purification by natural zeolites subjected to electrical discharge effect is carried out. On fig. 1 and fig. 2 adsorption ability of natural zeolite on SO_2 and NO_2 respectively, is shown.

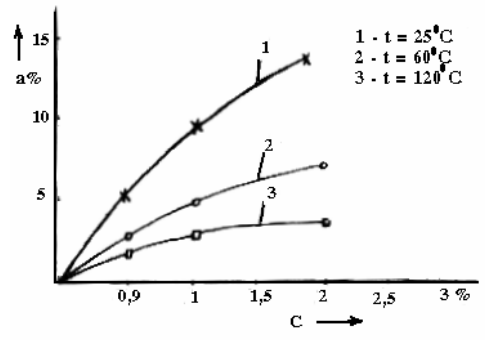

Fig.1. Amount of sulfur dioxide adsorbed by zeolite dependence on its contents in gas.

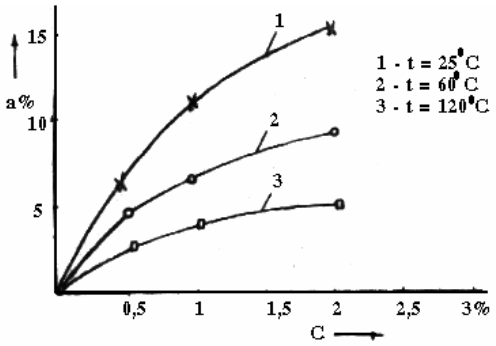

Fig. 2. Amount of nitrogen dioxide adsorbed by zeolite dependence on its contents in gas.

Research of full oil clearing from the sulfur compounds before burning, is carried out. The contents of sulfur full in oil is changes in range about of 0,5 %. At fuel oil burning the sulfur oxides are formed. The fuel oil is by the basic source of sulfur containing gaseous pollutions. Clearing of petroleum, including the fuel oil represents an extremely difficult problem. This problem is complicated because of its high viscosity that causes the process carrying under the raised temperatures. The reactant and adsorption clearing were used. Additional inclusion of an electrical field allows speeding up the clearing process. Here it is necessary to note following. As have revealed our researches, degree of clearing of fuel oil, as well as the clearing of petroleum as a whole largely depends on a specific kind of sulfur compound. One kind of sulfur compounds well cleared by certain adsorbents, other kinds of sulfur compounds-by other adsorbents. Therefore the adsorbents mixes were used also with the purpose of optimum clearing. The kinetics of fuel oil adsorption clearing process as without and at the presence of electrical fields is shown on fig 3.

As it is visible from drawing effect of electrical field appreciable improves the clearing process. Distinctive peculiarity of the thermal electrical plants waters is, at first, raised requirements to the water rigidity, at second, is salted of waste waters. The decision of an environmental problem in this case is possible by combination of a reactant clearing with an adsorption clearing. Our researches on the waters soften have shown that clearing of water from rigidity salts is possible up to practically complete absence of rigidity salts.

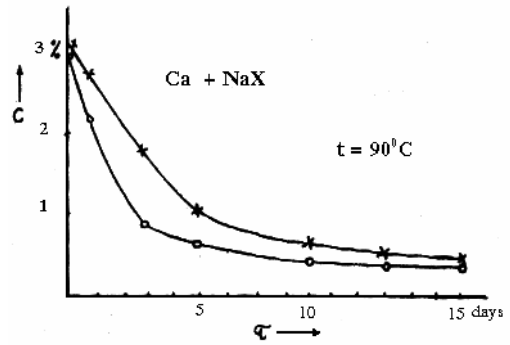

Fig.3. The fuel oil adsorption process without electrical field (x) and with electrical field (o).

The kinetics of water softens process at addition in it the reactant in various proportions is shown on fig 4.
As it is visible from a drawing, the clearing occurs practically during 1 hour. As a whole the water soften is reached by regulation of a reactant components ratio and it dosage. The similar mechanism is observed for mineralized water. In water treated by reactant occurs the

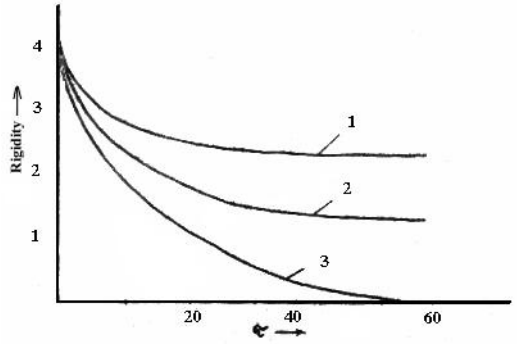

Fig. 4. Change of water rigidity during the contact with reactant.
The reactant consumption: 1 - 0,5 % of volume; 2 -1,0 % of volume; 3 - 3,0 % of volume.

sediment formation which leaves from cleared water. The formed sediment consists of oxides Ca, Mg, Na, Fe, Si. The sediment can be used to manufacture of various structural materials. By a combination of the specified methods of clearing, attraction of some other methods it is possible to achieve clearing of the thermal electrical plants waste waters.
It is necessary to note, that the search of optimum variants and modes of raising rate of clearing process requires further systematic researches, however the efficiency of such approach at the decision of problems of environmentally pured thermal electrical plants already today are the obvious fact.

Conclusion

Opportunities of minimizing the environmental damage arising as a result of working of thermal electric plants on mineral fuel are analyzed. Technological circuits of the clearing processes providing the complex decision of an environmental problem in case of plants, working on natural gas and black oil are offered. Adsorbents treated by the electric discharges have the active adsorptive ability. Clearing of such difficultly cleared product as black oil, under corresponding conditions can be substantially intensified.

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İSTİLİK ELEKTRİK STANSİYALARININ EKOLOJİ TƏMİZLİYİNƏ DAİR

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Təbii yanacaqla işləyən istilik elektrik boşalmalarının ətraf mühitə göstərdiyi zərərin minimuma endirilməsinin mümkünlüyü araşdırılmışdır. Təbii qaz və mazut yanacağı ilə işləyən istilik elektrik stansiyalarının ekoloji problemlərini təmin edən kompleks texnoloji sxemlər təklif olunur. Elektrik qaz boşalmaları vasitəsilə adsorbentlərin adsorbsiya qabliyyətinin yüksəldilməsinə nail olunmuşdu. Çətin təmizlənən mazut maddəsinin intensiv təmizlənməsi təmin olunmuşdur.

ОБ ЭКОЛОГИЧЕСКОЙ ЧИСТОТЕ ТЕПЛОВЫХ ЭЛЕКТРИЧЕСКИХ СТАНЦИЙ

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Проанализированы возможности сведения к минимуму ущерба, возникающего в результате работающих на ископаемом топливе тепловых электростанций. Предложены технологические схемы процессов очистки, обеспечивающих комплексное решение экологической проблемы в случае станции, работающей на природном газе и мазуте. Обработанные электрическим разрядом адсорбенты активизируют свою адсорбционную способность. Очистка такого трудно поддающегося очистке продукта, как мазут, при соответствующих условиях может быть в значительной степени интенсифицирована.