

## INTENSIFICATION OF ION EXCHANGE PROCESSES IN WATER SUPPLY SYSTEMS

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### ABSTRACT

The protection of the environment is arguably one of the most pressing issues of our time. The rational use of water resources, including the treatment of natural and wastewater, is of particular relevance due to their inextricable link with the protection of natural waters from pollution. One of the methods of rational use of natural water resources is the creation of recycling water supply systems for enterprises.

The adjustment of the salt composition of used process water by means of ion exchange on H- and OH-filters necessitates the intensification of ion exchange processes, which allows for an increase in the efficiency of water treatment, a reduction in the environmental impact, and the assurance of a reliable water supply for consumers.

Among the methods and techniques employed to enhance water treatment processes, those associated with the utilisation of rational, technologically sound schemes, the modification of existing ones and the development of novel methods and designs of water treatment devices

are regarded as the most promising.

The modification of ion exchangers allows for the following improvements: can be explained by the following factors:

- an increase in the working (dynamic) exchange capacity of ion exchange materials;
- an increase in the productivity of H- and OH-ion exchange units;
- an increase in the duration of the filter cycle;
- a reduction in the consumption of regeneration solutions.

This study investigates the technology of ion exchanger modification by process modification to improve ion exchange processes and reduce their cost.

The intensification of ion exchange processes in water supply systems can be explained by the following factors:

- the influence of modified ion exchangers on diffusion processes;
- quality indicators of technical water;
- modification parameters.

The following methods were employed to achieve the objective:

- Experimental measurements: A series of experiments were conducted utilising modified ion exchangers to analyse their impact on diffusion processes in water supply systems.
- Determination of modification parameters: A study was conducted on the parameters of ion exchangers modification, such as chemical composition, surface structure and other characteristics that could affect their efficiency.
- Statistical analysis of the results: The data obtained were subjected to statistical analysis to determine statistically significant differences in the effect of modified ion exchangers on ion exchange processes.

The utilisation of these methodologies enabled the acquisition of empirically validated outcomes pertaining to the augmentation of ion exchange processes in water supply systems through the technical modification of ion exchangers.

**Keywords:** ion exchange, salt composition, modification of ion exchangers, diffusion coefficient, hydrated ions, magnetic water treatment.

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