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PURIFICATION OF LIQUID RADIOACTIVE WASTE BASED ON THE ION-SELECTIVE METHOD

The objective of this study is to investigate the treatment of liquid radioactive waste with the use of ion-selective method based on computer simulation. It was necessary to choose process scheme which will provide a better degree of purification. The calculation of the technological units was carried out and the optimal values of their parameters were selected.

Today, the main sources of radioactive waste (RW) are operating nuclear power plants. One of the key issues that determine the further development of nuclear power is the issue of disposal of radioactive waste. Under the operation of NPPs three main types of radioactive waste are being produced: gas-aerosol, liquid and solid waste.

The main types of liquid radioactive waste (LRW) are stillage bottoms as a result of recycling drain water; exhaust sorbents coming from water treatment plants filters as well as other exhaust filter materials; sludge and slurry; waste oils and mixed liquids.

For processing liquid radioactive waste at nuclear power plants typically thermal, sorption and membrane methods are being used. The use of selective sorption significantly reduces the amount of final product and allows concentrating radionuclides of LRW in a small volume of sorbent.

Radioactive substances in the residues are in the form of simple and complex ions, neutral molecules and colloidal particles. The main radionuclides in liquid radioactive waste is 134Cs, 137Cs, 60Co, 54Mn. Isotopes of cesium are in the ionic form, radionuclides of cobalt and manganese are in the form of complex combinations. NPP's stillage bottom has usually hydrogen pH from 8 to 13, that is an alkaline environment, so ozone oxidation is the most appropriate way. Ozonation can be used almost at any stage of the cleaning liquid radioactive waste without compromising its overall performance. The products formed during the decay of ozone and its interaction with water molecules have a higher oxidation potential than the original molecule of ozone has. This leads to high efficiency of using ozone in purification of LRW production processes.

During the study a technological scheme of LRW selective sorption cleaning was proposed. To select the best option, calculations of the technological scheme's components were carried out, and the optimal values of their parameters have been chosen [1].

According to the results of calculations, the ion-selective method can be considered as the most promising for the cleaning and disposal of liquid radioactive waste of nuclear plants. In addition, for a number of nuclear power plants it provides an opportunity to extend the life of power generating units what is especially important for Ukraine in the crisis.

References

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