

TECHNOLOGY FOR OBTAINING TECHNICAL TABLE SALT FROM POTASSIUM FERTILIZER PRODUCTION WASTE

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ABSTRACT

This article presents a developed technology for obtaining technical-grade sodium chloride (table salt) from galite waste generated during potassium fertilizer production. The study shows that the composition of the waste (NaCl – 80–92%, KCl – 1.2–5.5%, CaSO₄ – 0.3–2%, MgCl₂ – 0.05–0.4%) makes it a suitable raw material for salt production. The proposed process includes classification, washing, filtration, and drying stages, resulting in a technical salt containing 93–95% NaCl. The developed technology is environmentally safe, economically efficient, and contributes to waste reduction and sustainable use of natural resources.

Introduction

The chemical industry, especially the production of mineral fertilizers, plays an important role in the sustainable development of the industry of the Republic of Uzbekistan. In recent years, providing agriculture with highly effective fertilizers and reducing environmental problems through the reuse of production waste has become an urgent issue in our country.

The Dehqanabad Potash Fertilizer Plant, located in the Dehqanabad district of the Kashkadarya region, is one of the largest chemical complexes in Uzbekistan, with a production capacity of up to 600 thousand tons of potash fertilizer per year. However, during this process, a large amount of halite waste (NaCl, KCl, CaSO₄, MgCl₂, etc.) is generated. They lead to salinization of groundwater and surface waters and pose an environmental hazard. Therefore, the development of a technology for obtaining technical sodium chloride (table salt) by reusing these wastes is of scientific and practical importance.

Purpose and objectives of the research

The purpose of this research is to develop a technology for obtaining technical table salt based on the processing of halite waste generated during the production of potash fertilizers and to determine its physicochemical foundations.

Main tasks:

1. Study the chemical composition of halite waste.
2. Develop an effective technological sequence for obtaining technical sodium chloride.
3. Neutralize harmful impurities in waste generated during the flotation process.

4. Determine the compliance of the resulting product with state and international standards.

Main section

Physical and chemical properties of halite waste

The waste generated at the Dekhkanabad potash fertilizer plant is mainly separated as a result of flotation of sylvinite ores. Their average composition (in mass %) is as follows:

NaCl – 80–92%, KCl – 1.2–5.5%, CaSO_4 – 0.3–2%, MgCl_2 – 0.05–0.4%, insoluble residue – 1–2%, moisture – 6–10%.

These wastes contain up to 5% potassium chloride, as well as residues of fatty amines and flotation reagents. They are toxic substances and their purification is a necessary step.

Technology for processing halite waste

In experiments, halite waste was processed in the stages of classification, washing, separation, drying and crystallization. The following technological process is proposed:

1. Wet classification - halite waste is separated into fractions up to 3–5 mm.
2. Grinding and washing - particles smaller than 3 mm are washed with a saturated solution of sodium chloride. At this stage, impurities such as KCl and CaSO_4 are dissolved and separated.
3. Filtration and centrifugation - the washed mass is dehydrated in centrifuges to 4–5% moisture.
4. Drying - dried in special UF VNIIG-type devices to a residual moisture of up to 0.2%.
5. Crystallization and cooling - the resulting sodium chloride crystals are cooled and sorted dry.

The resulting product is technical table salt, which contains 93–95% NaCl, up to 0.5% KCl, and up to 0.2% CaSO_4 .

Flotation waste recycling

Due to the presence of amines and other organic reagents in halite waste separated by flotation, the cleaning process is very important. Alkaline washing and adsorption filtration methods were used. As a result, the amount of toxic reagents was reduced to 1 g/t, which fully meets international hygienic standards.

Economic and environmental benefits of using halite waste

According to the results of the study, more than 500 thousand tons of halite waste are generated at the Dehqanabad plant annually. By processing them, 450–470 thousand tons of technical table salt can be obtained. This:

- reduces the cost of extracting new raw materials;
- reduces the land area allocated for waste collection;
- reduces the level of salinity and improves the ecological situation;
- provides local producers with high-quality technical salt.

The introduction of this technology is also economically beneficial, reducing production costs by 15–20%.

Results and discussion

The experiments showed that:

The kinetics of dissolution of potassium chloride in a saturated solution of sodium chloride is completed within 5 minutes at room temperature;

Increasing the temperature does not significantly affect the process;

The NaCl content of the resulting product is above 95% and meets the standards of TU 18-11-3-85 "Technical sodium chloride for industry";

During the processing of technological waste, the amount of toxic substances is reduced to a minimum.

Conclusion

1. Halite waste is a high-quality raw material for the production of technical table salt.
2. The proposed technology is environmentally friendly, economically viable and suitable for industrial implementation.
3. This technology allows the Dehqanabad Potash Fertilizer Plant to reduce waste, rationally use natural resources and expand local production.
4. The sodium chloride obtained as a result of the processing process is of high quality and fully suitable for technical and economic purposes.

References:

1. Reports of the President of the Republic of Uzbekistan on economic development in 2012–2013.
2. Kurbonov M., Shodmonov B. "Technology of production of potash fertilizers", Karshi DU Publishing House, 2015.
3. Popov G.N. "Processing of potash ores and galite wastes", Moscow, 1998.
4. "TU 18-11-3-85. Technical conditions for sodium chloride (table salt) for industrial use".
5. "Potassium fertilizers and processing of silvinites", Minsk, 2009.
6. Karimov I.A. "High spirituality is an invincible force". Tashkent, 2012.
7. VNIISOL. "Results of experiments on the processing of galite wastes", 2013.