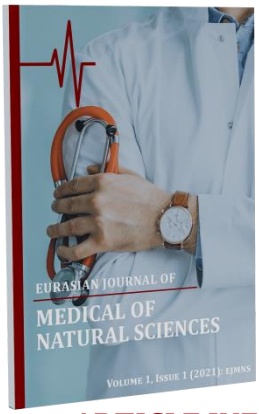
EURASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES
Innovative Academy Research Support Center
IF = 7.921 www.in-academy.uz



SOURCES AND MECHANISMS OF PHOSPHATE WASTE PRODUCTION IN DIFFERENT INDUSTRY SECTORS

Nabiyeva Mukhtasar
ORCID: 0009-0007-1004-9341
E-mail:: nmukhtasar632@gmail.com
Namangan State University
Level 1 Dontaranti
https://doi.org/10.5281/zenodo.14414715

ARTICLE INFO

Received: 05th December 2024
Accepted: 11th December 2024
Online: 12th December 2024

KEYWORDS

Phosphate, phosphate waste, chemical composition, environment, processing, raw materials.

ABSTRACT

This article examines the various sources and mechanisms of phosphate waste generation in various industries. It analyzes the processes of formation, chemical composition and properties of phosphate waste, as well as the impact on the environment. In order to reduce the negative impact on the environment, special attention is paid to the problems of effective management and processing of phosphate waste. The article also examines the importance of using phosphate waste as a raw material for the production of fertilizers and chemicals, as well as the possibilities and prospects for using it in a circular economy approach.

INTRODUCTION

Currently, the problem of generation and disposal of waste is becoming more and more urgent due to environmental problems and the increase in the amount of waste, which seriously damage the environment. One of these types of waste is phosphate waste generated during the production and use of phosphorus fertilizers, as well as in other industries.

Phosphate waste is waste containing phosphorus compounds that can be toxic and hazardous to the environment. Phosphate waste can vary according to the source, such as industrial waste, agricultural waste, phosphate ore mining and processing, etc. About 104 tons of phosphate ore per hour in Uzbekistan, primarily Tashko, operated by the Navoi Mining and Metallurgical Combine'ra is mined in a phosphate mine. This is approximately 900,000 metric tons per year on a year-round basis.

Phosphate waste, a by-product of this production, is significant, but exact annual figures for waste are not detailed. However, phosphate processing generates a large amount of waste, including phosphogypsum, which is a major environmental problem due to its volume and potential for pollutants.studying the issues of phosphate waste processing by studying the sources and mechanisms of formation of phosphate waste in various industries

LITERATURE ANALYSIS

The impact of phosphate waste on the environment is significant, causing soil, water and air pollution and deterioration of the quality of life of people and harming all living organisms. Phosphate waste can contain toxic substances such as heavy metals, radionuclides, and other

hazardous compounds that can leach into soil and water and accumulate in the bodies of animals and plants.

In order to prevent the negative impact of phosphate waste on the environment, it is necessary to develop effective methods of their collection, storage and processing. One of these methods is physico-chemical processing of phosphate waste, which includes various physico-chemical processes aimed at cleaning and processing waste. This method makes it possible to extract valuable components from phosphate waste and reduce its damage to the environment.

In addition, there are biological methods of treating phosphate waste, which are based on the use of living organisms such as bacteria and fungi to break down and dispose of the waste. These methods are more environmentally friendly and efficient as they convert phosphate waste into biogas and fertilizers that can be used in agriculture.

However, the processing of phosphate waste is not only ecological, but also economically and socially important. Introducing new recycling methods will help create new jobs, develop innovative technologies, and reduce waste disposal costs. In addition, the processing of phosphate waste helps to reduce dependence on imported phosphorus fertilizers and ensure sustainable development of agriculture.

Thus, the study and development of phosphate waste processing methods is an important task that requires an integrated approach and consideration of various aspects such as types of phosphate waste, their environmental impact, methods of collection and storage, physico-chemical and biological processing.

If we talk about the works of scientists who made a great contribution to the study of the formation and processing of phosphate waste in various directions, in recent years, the problem of phosphorus in the agroecosystem has entered a new stage of development along with traditional directions,methods of biological waste treatment, *Stefan Born* (in the field of sustainable development and resource recycling)[1], technologies for obtaining valuable materials such as construction materials and phosphorous fertilizers from phosphate waste, *John Tong* - researches on effective phosphate treatment systems for wastewater are of special importance for the theoretical basis of our research. In agriculture, the works of *Ernest Kennedy* (optimizing the use of phosphorus fertilizers and reducing the risk of phosphorus in the environment) and *John Lange* (an American scientist working on improving the absorption of phosphorus by plants and reducing the use of phosphorus fertilizers in agriculture)[2] are a small sample of scientists who are studying phosphate emissions today.

The relevance of the research "Generation of phosphate waste and methods of their processing" is due to several factors. First, phosphate waste is a serious environmental problem because it can contain toxic substances and contaminate water and soil resources. Second, phosphates are an important resource for the production of fertilizers and other chemical products, and their efficient use and recycling can reduce dependence on imports and reduce their negative environmental impact. Thus, the study of phosphate waste processing methods is of great practical importance and can contribute to sustainable development and environmental protection.

One of the main types of phosphate waste generated during the production of mineral fertilizers is sludge. Sludges are produced from the processing of phosphate ores and contain

significant amounts of phosphates as well as other inorganic and organic components. Depending on the raw materials and processes used, clays can have different consistencies and compositions. They usually contain a large amount of moisture and require special treatment before disposal [5].

Another type of phosphate waste generated during the production of mineral fertilizers is gypsum waste. Gypsum waste is produced by the processing of phosphate ores using sulfuric acid. During the formation of gypsum waste, sulfuric acid reacts with calcium contained in the ore, forming gypsum - calcium sulfate. Gypsum waste usually has a porous structure and contains a significant amount of moisture. They also contain various impurities such as inorganic salts and organic substances [3].

In addition to clay and gypsum waste, other types of phosphate waste are also generated during the production of mineral fertilizers. For example, it can be waste generated during the treatment and neutralization of wastewater containing phosphates and other pollutants. Wastes may also result from drying and granulation of fertilizers containing insoluble phosphates and other inorganic components. All these wastes require special treatment and disposal in order to prevent negative effects on the environment [2].

RESEARCH METHODS

During the research, we combin

ed literature review, data collection, site visits and laboratory analysis, which allowed us to understand this issue in a comprehensive way. During the research, we used: statistical analysis, comparison, various laboratory methods.

DISCUSSION

The formation of phosphate waste, particularly in the context of industrial and agricultural processes, involves several chemical and physical mechanisms. H

1. Phosphate Rock Mining and Beneficiation

Phosphate rock (mainly composed of apatite minerals such as fluorapatite, $Ca_5(PO_4)_3F$ is min

- **Crushing and Grinding:** T
- **Flotation:** To sep
- **Chemical Treatment:** To r

Waste Generation:

- **Tailings:** The gang
- **Slimes:** A mi

2. Phosphoric Acid Production

Phosphate rock is reacted with sulfuric acid to produce phosphoric acid, which is a key intermediate in the p

$Ca_5(PO_4)_3F+5H_2SO_4+10H_2O \rightarrow 3H_3PO_4+5CaSO_4 \cdot 2H_2O+HF$

Waste Generation:

- **Phosphogypsum:** The byproduct $CaSO_4 \cdot 2H_2O$, whi
- **Fluoride Emissions:** Gaseous emi444).

3. Fertilizer Production

Phosphoric acid is then used to produce various phosphate fertilizers such as monoammonium phosphate (MAP) and diammonium phosphate (DAP). The typi

$H_3PO_4+NH_3 \rightarrow NH_4H_2PO_4$(MAP)

$H_3PO_4+2NH_3 \rightarrow (NH_4)2HPO_4$(DAP

Waste Generation:

- **Ammonium Phosphate Sludge:** Contains unreacted
- **Dust and Particulate Emissions:** From

4. Agricultural Runoff

When phosphate fertilizers are applied to fields, not all the phosphates are absorbed by plants. A significant portion can run off into nearby water bodies, leading to:

Waste Generation:

- **Eutrophication:** Excessive nutrients in water bodi
- **Sedimentation:** Accumulation of phosphates in riverbeds and lakes,

Key Chemical and Environmental Issues

- **Heavy Metals and Radioactivity:** Phosphate rock contains trace amounts of heavy metals (like cadmium and lead) and radi
- **Fluoride Compounds:** The release of fluoride compounds dur
- **Water Pollution:** Runoff from agricultural lands contributes to nut

Mitigation Strategies

To manage and mitigate phosphate w

1. **Tailings Management:** Use of tailings ponds and recycling of water to minimize environmental discharge.
2. **Phosphogypsum Utilization:** Finding uses for phospho
3. **Advanced Treatment Technologies:** Using advanced chemical treatments to remove impurities and contaminants.
4. **Erosion Control:** Implementing best agricultural practices to reduce r
5. **Regulation and Monitoring:** Stric

Waste is a significant problem in the production of mineral fertilizers, as it contains large amounts of phosphates, which are a valuable resource and can be used in other industries. Therefore, it is an urgent task to develop effective methods of processing and disposal of phosphate waste.

One of the methods of processing phosphate waste is neutralization. This process involves treating the waste using various chemicals to neutralize harmful components and make the waste environmentally safe. Neutralization of phosphate wastes can be accomplished by adding alkaline reagents, such as sodium or potassium hydroxides, which react with the acidic components of the waste to form insoluble salts.

Another way to process phosphate waste is to enrich it and obtain valuable components. For example, phosphate waste can be processed using various physical and chemical methods that extract phosphates and other valuable components from the waste. These components can be used in the production of fertilizers or other products.

There are also ways to treat phosphate waste using biological processes. For example, phosphate waste can undergo aerobic or anaerobic biological treatment with the help of special microorganisms capable of breaking down organic and inorganic components of the waste. This makes it possible to reduce the amount of phosphates and other pollutants in the waste and make it safe for the environment.

The use of these and other methods of processing phosphate waste allows to reduce their negative impact on the environment and to effectively use valuable components in the waste. However, it should be noted that each method has its own advantages and limitations, and the choice of the optimal method depends on specific production conditions and environmental requirements. Therefore, it is an important task to develop complex approaches to the processing of phosphate waste, to reduce their negative impact on the environment and to use valuable resources effectively.

IThe current status of phosphate waste management in Uzbekistan is characterized by several challenges and ongoing efforts to improve environmental practices. Uzbekistan's phosphate industry produces significant waste, primarily during the mining and beneficiation processes. This waste includes tailings and other by-products, which pose environmental risks if not properly managed.

To address these challenges, Uzbekistan has undertaken various initiatives aimed at improving its waste management systems. The country has partnered with international organizations, such as the United Nations Environment Programme (UNEP), to enhance its capacity for handling chemical and waste management. This includes efforts to strengthen legislative and regulatory frameworks, improve coordination between responsible institutions, and increase public awareness about environmental issues.

Additionally, there are ongoing research and development projects focused on finding sustainable solutions for phosphate waste. These projects aim to recover valuable minerals from waste streams and explore alternative uses for phosphate by-products, such as in the construction industry, to minimize environmental impacts.

Overall, while our country faces significant challenges in managing phosphate waste, the country is actively working towards more sustainable and efficient waste management practices through international cooperation and innovative research.

CONCLUSION

This work investigated the important aspects of the formation and processing of phosphate wastes. Each type of waste has its own characteristics and requires specific processing methods.

Thus, studying the formation and processing of phosphate waste is an important task that requires a complex approach and the use of various methods. This allows reducing the negative impact of waste on the environment, efficient use of resources and achieving sustainable development. Introduction of modern technologies, raising awareness of the population about the problem of phosphate waste is an important step in solving this problem.

References:

1. Samonov AE, Melentyev GB, Vanshin Yu. Environmental impact of phosphogypsum and pyrite slag stockpiles and prospects of their complex processing to obtain highly liquid marketable products // Ecology of industrial production. - 2008. - No. 2. – Pages 65-76. URL: https://elibrary.ru/item.asp?id=11765779 (date of access: 05/29/2024).
2. Abdrakhimov VZ, Abdrakhimova ES Heat-resistant concrete based on orthophosphoric acid, non-ferrous metallurgy and chemical industry wastes // Construction and geotechnics. -

2021. - T. 12. - No. 1. – Pages 72-85. URL: https://cyberleninka.ru/article/n/zharostoykiy-beton-na-osnove-ortofosfornoy-kisloty-othodov-tsvetnoy-metallurgii-i-himicheskoy-promyshlennosti (access date: 29.05.2024).

3. Abdrakhimov VZ, Abdrakhimova ES Use of aluminum-containing nanotechnological raw materials and coal processing waste in the production of heat-resistant concrete // Construction and reconstruction. - 2021. - No. 1. – Pages 96-105. URL: https://construction.elpub.ru/jour/article/view/342 (access date: 05/29/2024).

4. Abdrakhimov VZ, Abdrakhimova ES Use of oil production waste in the production of heat-resistant porous concrete based on phosphate binder // Perspective materials. - 2017. - No. 4. – Pages 55-64. URL: https://elibrary.ru/item.asp?id=28888464 (date of access: 05/29/2024).

5. Alpatov AV and others ECOLOGICAL ASPECTS OF CHIPPING, PRODUCTION AND USE OF HOMO-MOSHI // Economics, labor, management in agriculture. - 2021. - No. 11. – pp. 84-93. URL: https://elibrary.ru/item.asp?id=47453705 (access date: 05/29/2024).

6. Bambetova KV, Attasauov M.Sh., Liev AA THERMAL INSULATION MATERIALS BASED ON GYPSUM AND AGRICULTURAL WASTE // Fundamental and applied scientific research: current problems, achievements and innovations. - 2023. - B. 54-56. URL: https://naukaip.ru/wp-content/uploads/2023/02/MK-1623.pdf#page=54 (date of access: 05/29/2024).

7. Barkhatov VI, Dobrovolsky IP, Kapkaev Yu.Sh. Production and consumption waste — stock of building materials // Chelyabinsk: Chelyabinsk publishing house. state un-ta. – 2017. URL: https://www.csu.ru/Shared Documents/IEKOBiA/Patents, Monographs, Articles/MONOGRAPHYBarkhatov_Dobrovolsky_Kapkaev_Industrial and consumer waste.pdf (access date: 29.05.2024).

8. Bezdetko EO DIFFERENT METHODS OF PLANT WASTE CONSOLIDATION IN BIOTECHNOLOGY // International scientific and technical conference of young scientists of BSTU. Dedicated to the 170th anniversary of VGShukhov's birth. – 2023. – B. 23. URL: https://elibrary.ru/download/elibrary_54377833_97806527.pdf#page=23 (access date: 05/29/2024).

9. VOYNASH SA Method of biological treatment of agricultural waste by microbial synthesis // Fundamentals and prospects of organic biotechnologies. - 2020. - No. 3. – Pages 3-8. URL: https://elibrary.ru/item.asp?id=44261234 (date of access: 05/29/2024).

10. Vasilyeva MV and others state regulation of foreign economic activity: legal, personnel and organizational aspects. – 2021. URL: https://elibrary.ru/item.asp?id=46265160 (date of access: 05/29/2024).

11. Vinokurov SE et al. Magnesium-Potassium-Phosphate Matrix for Stabilization of Intermediate-Level Wastes Containing Actinides and Ammonium Nitrate // Radioactive Waste. - 2018. - No. 2. – Pages 105-113. URL: http://en.ibrae.ac.ru/docs/Radwaste_Journal_2(3)18/105_113_Vinokurov.pdf (access date: 05/29/2024).

12. Vorobyov AV, Evdakova LN "Waste" — a concept in the system of natural and socio-economic sciences and their classification // Actual problems of humanities and natural sciences. - 2014. - No. 9. – Pages 122-127. URL: https://cyberleninka.ru/article/n/othody-

ponyatie-i-ih-klassifikatsiya-v-sisteme-estestvennyh-i-sotsialno-ekonomicheskih-nauk (date of access: 29.05.2024).

13. Glagolenko Yu V. et al. Processing of nuclear fuel and liquid radioactive waste at Mayak PA. - 1997. - T. 83. - No. 6. – Pages 446-452. URL: https://j-atomicenergy.ru/index.php/ae/article/view/4400 (access date: 29.05.2024).