Physicochemical Studies of Complex Fertilizers Obtained from The Decomposition of Guliob Phosphorites

Panjiyev Olimjon Kholliyevich	Ph.D., Associate Professor, Karshi Institute of Engineering and Economics (Republic of Uzbekistan), e-maildoc.olimjon573@mail.ru
Panjiyev Arzikul Kholliyevich	Ph.D., Associate Professor, Karshi Institute of Engineering and Economics (Republic of Uzbekistan),
Nurmatov Umarali	Master of Karshi Institute of Engineering Economics (Republic of Uzbekistan),
Ibatov Rakhmat Asrorovich	Student of Karshi Institute of Engineering and Economics phone number: 221-09-23, fax: 224-13-95

ABSTRACT

Currently, the problem is the lack of phosphorus fertilizers and the inability to fully supply them. This article suggests using Guliob phosphorites to get rid of this problem. The author also analyzes complex fertilizers obtained from the decomposition of Guliob phosphorites using various physicochemical researchs.

Keywords: Phosphate, mineral fertilizer, ores, carbonate compounds, clay minerals, organic substances, agronomic ore fields, dallite and diadoxite minerals, potassium chloride, calcium nitrate, calcium hydrophosphate.

Introduction

At present, the phosphorite complex is not able to completely provide enterprises with phosphate raw materials. In order to fully meet the demand for phosphorus fertilizers in agriculture of the Republic, it is necessary to create effective methods of obtaining mineral fertilizers utilizing non-industrial phosphorites. Guliob phosphorites belong to the granular species similar to the large phosphorite mines in the African-Arab terretories. Reserves of phosphate raw materials at the rate of 100% R2O5 amount to 43.5 tons and can meet the demand of the Republic of Uzbekistan for phosphorus fertilizers for more than 100 years [1].

Main part

It should be noted that the main component of Guliob phosphorites belongs to poor-quality ores on phosphorus. There are large amounts of carbonate compounds (calcium modulus - CaO: P2O5 = 2.85), clay minerals and organic substances in the ore composition. In the extraction of Kyzylkum phosphorites, in determining the concentration of phosphorus by dump truck-radiometric method which is the main component of it, phosphorites are divided into several sorts. The lowest quality ore is a mineralized mass and the amount of P2O5 in it forms 10-12%.

In the territory of Uzbekistan, the phosphate fields such as Guliob (Guliob), Auminzatog (Auminzatau), Chukay-Tukay (Chukay-Takay), Khojayli (Khodjeyli), Khojakul

(Khodjakul), Bolaqara (Balakarakskiy), Bulakarakiy (Balakarakskiy), whose basic phosphorus quantity was lower than that of certain phosphorites and other agronomic ore mines have found. The local low-quality raw materials mentioned above differ drastically from each other in terms of chemical composition, structure and properties.

Phosphorus minerals in the composition of Guliob phosphorite, located in Sariasia district of Surkhandarya region, mainly consist of dallite and diadoxite minerals. The total amount of these minerals in the ore is 31%. The amount of reserve includes 551,000 tons of P2O5 [1]. Phosphorites occur in black and brown. The amount of phosphorus anhydride in it varies from 4.13% to 22.3%. It also contains small amounts of MgO, CO_2 and F, SO_3 in the diadoxite mineral, not in the gypsum content.

We have performed radiographic and thermal analyzes to determine the salinity of complex fertilizers formed by the decomposition of guliob phosphorites in the presence of potassium chloride with nitrogen acid (HNO3 norm -75 and 100%, P2O5: K2O = 1:1). Radiographic analysis of complex fertilizers was carried out on a DRON-0.5 diffractometer formed from filtered copper radiation, under the condition that is 25 kV voltage, 8 mA current, 2 grad./min. speed of the meter. We performed the identification (detection) of the diffraction lines by comparing the rapid values of the distances between the peaks of the expected salts and fertilizer samples. The 5.20; 2.79; 2.45-2.46; 2.03A° diffraction lines belong to the four aqueous calcium nitrates. The distance between the peaks 4.23-4.24; 2.62-2.63 A° describes the calcium dihydrate hydroorthophosphate in the fertilizer. The 3.69-3.70; 2,95 A° diffraction peaks prove the presence of calcium hydrate dehydroortophosphate. The distance between 2.71; 1,837 A° diffraction peaks belong to fluorocarbonate apatite and 2.22; 3.14 A° ones belong to potassium chloride. If the diffraction peaks are 3.06-3.07; 2.25 and 2.27 A°, we can say that they belong to ammonium nitrate. Some lines overlapped nitrates, phosphates, and other compounds due to the proximity of the distance between the peaks.

The sample (HNO_3 criterion-100%, P_2O_5:K_2O =1:1) derivatogram (Figure 1) has been got down on the Paulik-Erdey derivatogram at 900°C and the weight of the polished sample is 202 mg, and the TG-200 heating rate is 10 degrees / min [2]. The loss of sample mass at 900oS is composed of 60.89%.

Endothermic effects at 100–330°C characterize the loss of absorbing moisture, crystalline water of calcium nitrate and calcium hydrophosphate, and ammonium nitrate. Weak elongated effects in the interval of 330–400°C express the decomposition of SaHPO4 to pyrophosphate. It indicates the conversion of calcium nitrate to nitrite in the most lost thermoeffect areas of the sample mass at that same time.

Extensive thermal effects at 510-730°C were observed in the samples, explained by the polymorphic change of the quartz mineral, the simultaneous decomposition of residual carbonates and other minerals.

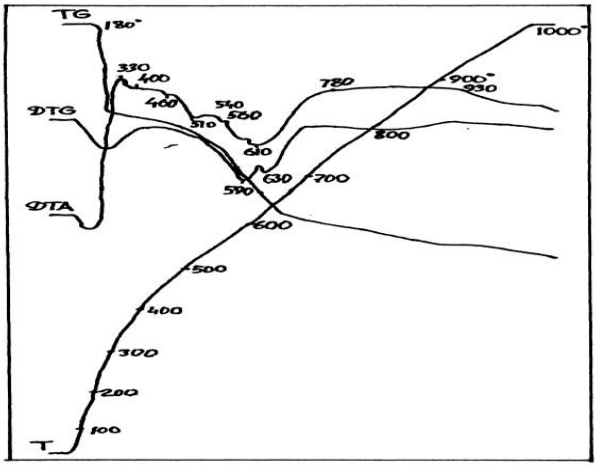

Figure.1. The norms of HNO3 are - 100%, the derivatogram of nitrophosphates with P2O5: K2O = 1: 1.

Extensive thermal effects were observed in the samples at 510–730°C, explained by the polymorphic change of the quartz mineral, simultaneous decomposition of residual carbonates and other minerals.

Conclusion

Thus, the results of various methods of research (thermogravimetry and radiography) of complex fertilizers obtained on the basis of Guliob enriched phosphorites show that the composition of the fertilizer mainly consists of calcium and ammonium nitrate, calcium dihydrate hydrogen orthophosphate and monophosphate, activated phosphates and potassium chloride.

References:

1. Reymov A.M. Development of technologies for obtaining nitrocalciphosphate nitrocalcium sulfophosphate fertilizers on the basis of Kyzylkumskix phosphorites at low nitric acid levels: Author. diss…. cand. techn. sciences. - Tashkent, 2004.-23 p.
2. Topor N.D., Ogorodova L.P., Melchakova L.V. Thermal analysis of minerals and inorganic compounds. M.: MGU. 1987.-270 p.
3. Панжиев О.Х., Бегимқулова Д.,Усмонова М The effect of the ratio of components in the initial reaction gas mixture and the duration of the synthesis on the product yield. //“International Engineering Journal for Besearch & Development” Impact Factor: 6,549. – India 2020 Vol: 5, Issule
4. https://ru.m.wikipedia.org
5. https://missis.ru