TEST Engineering & Management

January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847

Organomineral Fertilizers Based on Sediments of Waste Water and Mineralized Mass of Phosphorites of Central Kysylkum

Doniyarov Nodirjon, *Candidate of Technical Sciences, docent, Dean of the Chemical and Metallurgical Faculty Navoi State Mining Institute*, Uzbekistan

Temirov Uktam, *Doctorant, Department of Chemical Technology Navoi State Mining Institute, Uzbekistan*

Usanbaev Najimuddin, *Doctor of Technical Sciences, Leading Researcher, Institute of general and inorganic chemistry of Uzbek Academy of Sciences, Uzbekistan*

Asvorov Anvar, *Lecturer, Department of Metallurgy, Navoi State Mining Institute, Uzbekistan*

Murodov Islom, *Lecturer, Department of Metallurgy, Navoi State Mining Institute, Uzbekistan*

Tagaev Ilxam, *Candidate of Technical Sciences, docent Department of Chemical Technology Navoi State Mining Institute, Uzbekistan*

Khusenov Kakhramon, *Candidate of Technical Sciences, docent Department of Chemical Technology Navoi State Mining Institute, Uzbekistan*

Article Info
Volume 82
Page Number: 15839 - 15847
Publication Issue:
January-February 2020

Article History

Article Received: *18 May 2019*
Revised: *14 July 2019*
Accepted: *22 December 2019*
Publication: *28 February 2020*

Annotation.*The article shows that by decomposing the mineralized mass of phosphorites of the Central Kyzyl Kum with an incomplete norm of sulfuric acid (30-70% of stoichiometry in CaO), followed by the interaction of decomposition products with urban sewage sludge, organic-mineral fertilizers can be obtained. The optimal ratios of the starting substances and the norm of sulfuric acid for the decomposition of the mineralized mass upon receipt of organic fertilizers based on sewage sludge and mineralized mass were determined.*

Keywords:*Sediments of waste water,mineralized mass, sulfuric acid, phosphate, calcium, humic acids, organomineral fertilizers.*

I. INTRODUCTION

A large amount of experimental data is currently available, confirming the positive impact on crops and on soils of organic and organic fertilizers obtained on the basis of urban wastewater (SWW). With proper use, taking into account the individual approach to different crops, to the soil characteristics and the properties of the fertilizers themselves, not only crop yields increase, but the quality improves with a significant reduction in their cost, in addition, you can save the consumption of scarce mineral fertilizers, therefore, waste water can be considered as a source fertilizer resource[1-3].In order for waste water to have a positive effect in soil and plants, it is necessary to master the technologies for its processing into high-quality organic fertilizers.

From literature data, various methods are known for processing wastewater sludge into organomineral fertilizers and methods for its disposal. So, in the patent [4] SWWpre-dried to a moisture content of 10-25% and then subjected to grinding.Milled to a grain size of 0.1-1.0 mm, the sediment undergoes magnetic separation with a magnetic field of at least 1000 E(80kA/m). In this case, the WWS is divided into two fractions: enriched with magnetic materials – iron oxides, nickel chromium, compounds like spinel and non-magnetic fraction.WWS is approximately 20-30% depleted in iron, chromium, copper, zinc, calcium, magnesium, those, components, which in percentage terms make up the

January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847

majority of the total content of heavy metals in WWS.The non-magnetic fraction is treated with an acidic backwash solution. The treatment is carried out at 40-60 ° C with an acidic washing solution, which is a mixture of 10% sulfuric acid solution. The precipitate obtained is washed with water, the wash water is used to prepare an acidic wash solution, the spent acid wash solution is made alkaline in a known manner and a precipitate of heavy metal humates is isolated at pH 1.5 - 1.8, which is treated with an ammonia solution to pH 10.5 - 11.0 and the resulting solution of ammonium humate is used to neutralize the wastewater sludge after the water washing operation, the fertilizer obtained is dried, and heavy metals are isolated from the spent acidic washing solution, and the regenerated solution p is used for sludge treatment.

In patent [5] WWS is placed on a cartridge with a filter bottom and directs to alkaline extraction. The treatment is carried out with a solution containing 0.2-1.0 mol/l potassium or sodium alkali, while the sediment cassette makes vertical movements in the container with the extractant with a frequency and amplitude that ensure the exchange of the extractant in the cassette by at least 80% for each fluctuations. Processing is carried out at a temperature of 45-650C with a ratio of liquid and solid phases 3 ÷ 7-1. When alkaline extraction from precipitation occurs, organic compounds are extracted and dissolved in a dissolved state with the formation, first of all, of alkali metal humates, which are water-soluble forms of humate-containing compounds. In addition, inorganic components pass into the solution in micro quantities. The resulting liquid organomineral fertilizer then goes to the spill in the packaging.After alkaline extraction, the WWS is washed to remove alkaline extractant.After alkaline extraction, the WWS still contains a sufficient amount of valuable organic substances (up to 50% of the initial amount).Then the precipitate is subjected to acid treatment, which is a solution containing 0.5-1.5 mol/l hydrochloric acid. During acid treatment, heavy metals pass into solution. Then the sewage sludge is washed with water from acid residues, neutralized with calcium oxide and dried, and then used as organic fertilizer.The acidic wash solution is regenerated by distillation.The distillate containing 0.5-1.5 mol/dm^3 of hydrochloric acid is returned to the process and the bottom residue of the heavy metal chloride precipitate is sent to the hydrochloric acid regeneration apparatus by the thermal method.

In patent [6] heavy metal ions are first removed from sewage sludge by treating WWS with a solution of nitric acid at a concentration of 1.0-1.25mol/dm^3 at a temperature of 50-70^{0}C for 10-20 minutes. The process is carried out with a ratio of solid and liquid phases equal to 1: 5, and Reynolds numbers greater than $1 \cdot 10^5$. Under these conditions, the residual content of heavy metals meets the standards for this type of fertilizer. After filtration, neutralization of residual acidity with alkaline agents such as potassium hydroxide, ammonium hydroxide, calcium carbonate is carried out to obtain organic fertilizer. Metals separated from the precipitate are precipitated from the solution and processed into sludge, from which they are then regenerated.

Inpatent[7] prepares 1000 l of a mixture of 200 l of WWS (bulk density of about 1 kg / dm3) and water in a container in which the mixture is circulated. The mixture is circulated with a 4.0 kW circulation pump. The temperature of the prepared mixture is 40^{0}C. Then, an alkaline reagent - 12.5 kg of NaOH is added to the container with the prepared mixture and alkaline extraction of the mixture is carried out by ultrasonic treatment for 60 minutes in an ultrasonic reactor. Then carry out the sedimentation of the mixture during the day to separate the ultrafine suspension of fibrous organic material, draining the liquid phase and unloading the insoluble part of the precipitate. The result is 900 l of liquid organic fertilizer and about 100 l of sediment of the latter is used as fertilizer for growing industrial and forest crops.

According to the method [8] WWS is mixed with chopped straw in a ratio of 1:0.11 by weight or 1: 1.82 by volume. Potassium sulfate is added to this mixture in an amount of 0.2-0.3% by weight of the substrate and composted in piles. With a compostable mixture humidity of 70-75%, this amount of potassium sulfate increases the total potassium content in terms of K_2O, the ripening time of compost based on WWS and sawdust in natural climatic conditions of the Central District of the Russian Federation is 3.5-4 months in spring and summer, in autumn -winter time 5-6 months. At the same time, to speed up the composting process, the

January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847

compost mass is periodically mixed in the spring-summer time every 4-5 weeks, and in the winter every 6-8 weeks. The temperature regime is restored within 3-4 days in the spring-summer time and 8-10 days, winter time will bake the flow of aerobic processes. Composting a mixture of WWS with sawdust or straw is carried out on the composting site with soil or hard surface. With a two-row arrangement of collars with their height 2.5 m, width 6 m, length 50 m, each collar has a volume of 375 m^3. In summer, the amount of compost in piles is reduced by 30-40% due to the acceleration of the composting process of compost mixture based on WWS and sawdust. The final product - compost is a nutrient-rich, non-caking dark gray product. The scope of this compost is in green construction, agricultural production for growing industrial, fodder, grain and green manure crops, forestry for planting forestry crops along roads, in nurseries of forest and ornamental crops, floriculture, for cultivating depleted soils, reclamation of disturbed lands and slopes of automobile roads; landfill reclamation.

In work [9] it is proposed to introduce in WWS ground siliceous flask in combination with potassium chloride. Due to this method, it is possible to eliminate the odor, in addition, the addition of potassium chloride not only promotes deodorization, but also enriches fertilizers with potassium, the content of which in the sediments is much lower than the content of nitrogen and phosphorus. Consumption of deodorizing mixture is 6-7% by weight of WWS. In laboratory conditions, granular organic-mineral fertilizers from WWS with the addition of a deodorant mixture were obtained. The size of the granules was 3 mm, and its strength was 2 kg per granule. Based on the results of laboratory experiments, a technological scheme was developed for organizing a workshop for the production of organic mineral fertilizers. Field tests of organic fertilizers based on WWS showed their high agrochemical effectiveness. The height of seedlings of winter rye in areas with the application of this fertilizer was 2 times higher than in areas without the introduction of organic fertilizers.

It can be seen from the foregoing that the precipitation generated during the wastewater treatment of cities is classified as a raw material resource for organic fertilizers.

It should be noted that at present, the main problems of agricultural production in many countries of the world, including the Republic of Uzbekistan, are the lack of especially phosphorus fertilizers, a decrease in the content of humus in soils and salinization of soils, these problems can be solved to some extent by organizing large-scale production and application organic fertilizer.

On the advantages of organic fertilizers over mineral fertilizers in the literature, a lot of information. So, at work [10] it is said that the greatest effectiveness of organic and mineral fertilizers is achieved when they are used together, that is, the creation of organic fertilizers. In cotton growing, a highly effective method is the joint application of organic and mineral fertilizers. Its advantage is due to the temporary biological fixation of nutrients of mineral fertilizers by microorganisms with their subsequent release in an accessible form for plants. This process reduces the movement of nitrogen into the deep horizons of the soil and the removal of the surface layer, resulting in improved nitrogen and phosphorus nutrition of plants. The experiments conducted at the Uzbek Research Institute of Cotton Production showed that the cotton crop (on average over five years) amounted to: from mineral fertilizers - 50.2 c/ga, manure - 38.8, and when applied together - 53.5 c/ga[11].

In work [12] it is noted that only organic fertilizers, when used together with mineral fertilizers, can ensure a deficit-free balance or an increase in humus in typical crop rotation zones. These words are confirmed by the experience in the Grodno region (Belarus), where the use of organic fertilizers on sod-podzolic soil increased over 60 years the humus reserves in the 0 - 150 cm layer by 21 - 24% compared with the control and by 49% with the virgin soil [13]. In the experiments of Fokin A.D. the plant utilization rate of phosphorus from decaying plant residues was more than 4 times higher than that of mineral fertilizers [14]. With a high content of humus in the soil due to more favorable agrophysical properties and improved conditions for the development of plants, the return on mineral fertilizers increases by 1.5 - 2 times. In field experiments of the Belarusian Research Institute of Soil Science and Agrochemistry, a change in the amount of humus in sod-podzolic soil

January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847

from 1.5 to 2.5 - 3% led to a 3-fold increase in the efficiency of 1 kg NPK fat [15].

Raw materials for organic and organic fertilizers include: litter manure, litterless manure, bird droppings, peat, brown coal, green manure, straw, sapropel, household and industrial waste, and sewage sludge [16].

As already noted, currently in many countries of the world there is a decrease in the resources of phosphate raw materials. In 2018, enterprises of Uzkimyosanoat JSC of the Republic of Uzbekistan produced 153.8 thousand. tons of phosphate fertilizers (in terms of 100% P_2O_5). And the need for agriculture is 691.7 thousand tons of P_2O_5. These figures indicate that the availability of phosphorus fertilizers in agriculture is insufficient. Currently, at the Kyzylkumphosphorite plant, when highly carbonized phosphorites of the Central Kyzyl Kum are enriched, waste is generated in the form of a mineralized mass with a content of 13-15% P_2O5 and sludge phosphorites with a content of 8-12% P_2O_5. The total volume of accumulated waste phosphorites already reaches 15 million tons. With a deficit of phosphate fertilizers, these waste phosphorites can serve as a large reserve in terms of increasing the production of phosphate fertilizers. Traditional phosphate processing methods, such as nitric acid and sulfuric acid, are not acceptable to them.Alternative to traditional acidic methods for the production of phosphate fertilizers can be alternative methods that use organic brown coal, animal waste, poultry and sewage sludge instead of strong mineral acids.

Based on the foregoing, we carried out a number of studies on the production of organic fertilizers based on substandard phosphorites, cattle and poultry manure by composting and also accelerated methods [17, 18].It is shown that even from such waste phosphorite, such as mineralized mass and sludge phosphorite, it is possible to obtain highly effective nitrogen-phosphorus-humic fertilizers. The resulting organic fertilizer using mineralized mass and bird droppings has the composition(wt.%): P_2O_5 total – 6,53; P_2O_5acceptable - 4,04; CaOtotal – 17,12; N – 4,21; organicmatter -28,38; humicacids – 1,56, fulvicacids 6,12, water-solubleorganicsubstances 1,42, andusingsludgephosphorite(wt.%): P_2O_5 total – 5,55; P_2O_5 acceptable – 3,79; CaOtotal – 16,43; N – 4,33; organicmatter – 28,74; humicacids – 1,65, fulvicacids – 6,24, water-solubleorganicsubstances – 1,52.[19].

In our previous work [20] The processes of obtaining organic fertilizers based on sewage sludge and sludge phosphorite were investigated.The combined processing of sewage sludge and sludge phosphorite made it possible to use activated sludge microorganisms to convert non-digestible forms of phosphorus of substandard phosphorites into an assimilable form for plants, since microorganisms contained in sewage sludge can use many minerals, including phosphate, for their growth and development, in addition to this, sewage sludge contains a significant amount of carboxylic acids that can bind calcium ions contained in partially decomposed mine phosphorites acid acids. That is, under the influence of organic acids formed during the decomposition of wastewater sludge, phosphorus, which is part of substandard phosphorites, passes from an unapproachable form into a form that is digestible for plants and thereby will show its fertilizing properties. In addition, activated phosphorite with mineral acids binds $(NH_4)_2CO_3$, free NH_3 and other organic volatile organic substances into non-volatile forms, spreading an unpleasant odor into the environment.

At this stage of the work, to study the processes of obtaining organic fertilizers, the wastewater sludge from the city of Navoi was used (wt.%): Moisture - 65.43; ash - 9.74; organic matter - 24.83; humic acids - 3.05; fulvic acids - 7.47; water-soluble organic substances - 2.13; P_2O_5 - 1.39; N 1.17; K_2O - 0.44; CaO - 4.14 [21].

II. OBJECT AND METHODS

To table 1 results of mass spectrometric analysis (ICP – MS) of sewage sludge ash. It follows from the table that the sewage sludge contains a number of trace elements necessary for the growth and development of plants. Mineralized mass (MM) was used as phosphate feedstock.Before use, it was ground to a particle size of 0.25 mm. The composition of MM is shown in table 2. from table 2 it is seen that MM is characterized by a low phosphorus content (8.76% P_2O_5), a high content of carbonates (19.72% CO_2) and a high value of calcium module (CaO: P_2O5 = 5.19).

January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847

The chemical analysis of the sewage sludge of the city of Navoi, sludge phosphorite and their products was carried out by the following methods. Humidity was determined according to GOST 26712-85, ash content according to GOST 26714-85 and organic matter according to GOST 27980-80. The amount of the water-soluble fraction of organic substances extracted from the products with water was determined by filtration and evaporation in a water bath, drying the solid residue to a constant weight, and then burning it to determine the ash content and subtract it. Humic acids were isolated by treating the products with 0.1 N alkali solution followed by acidification of the solution with mineral acid [22]. The solid phase after separation of alkali-soluble organic substances from it contains residual organic matter. It was thoroughly washed with disco, dried to constant weight and the content of organic substances was determined. The difference between the amounts of alkali-soluble organic substances and humic acids gives us the content of fulvic acids. All P2O5 forms were determined by the gravimetric method by precipitation of the phosphate ion with a magnesia mixture in the form of magnesium ammonium phosphate, followed by calcination of the precipitate at 1000-1050°C according to GOST 20851.2-75. Assimilable forms of P_2O_5 were determined by solubility in both 2% citric acid and 0.2 M Trilon B. The determination of CaO was carried out complexometrically: by titration with a 0.05 N Trilon B solution in the presence of a fluorexon indicator.

Table 1. The results of mass spectrometric analysis of ash from sewage sludge of the city of Navoi

Name and content of elements, in g/t									
Composition of wastewater sludge ash									
Li 600	Si 100000	B 3000	Na 40000	Mg 30000	Al 80000	P 62310	K 32000	Ca 303608	Sr 2000
Mn 1000	Fe 11312	Co 80	Ni 130	Cu 1000	Zn 30	Mo 1,46	Ag 3,01	Hg 2,0	Ti 500

Table 2. The chemical composition of the mineralized mass

The content of components, weight. %								
P_2O_5	CaO	Al_2O_3	Fe_2O_3	MgO	F	CO_2	SO_3	H.O.
14,27	42,01	1,12	1,34	1,45	1,73	18,57	1,05	13,14

III. Results and Discussion

For the decomposition of MM used sulfuric acid with a concentration of 92%. The rate of sulfuric acid varied in the range of 30-70% of the stoichiometry for the decomposition of CaO phosphate feed. The experiments were carried out as follows, sulfuric acid was slowly poured into a glass reactor in which a sample of fossy was located. The duration of the interaction of the components was 30 minutes, after which a sewage sludge was added to the pulp, and stirring was continued for 60 minutes. Drying was carried out at 80°C until the moisture content in the finished product 10-15%. The processing of products of sulfuric acid decomposition by sewage sludge was carried out in the range of weight ratios of sewage sludge to MM from 100: 10 to 100: 40. The results are shown in tables 3.4 and figures 1-3.

From the table 3,4and pic. -3 it can be seen that the higher the norm of sulfuric acid and the more wastewater sludge is taken, the less P_2O_{5total} in the product, but the greater the relative content of the assimilable form of P_2O_5, the water-soluble form of CaO, organic substances and humic substances. As can be seen from the table. 3 and 4 with the ratio of WWS: MM = 100: 10 and the norm of sulfuric

January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847

Table 3. The composition of organic fertilizer obtained by activation of the mineralized mass with sulfuric acid and WWS

The mass ratio of WWS to phosphorite	P_2O_{5total}%	$P_2O_{5\ ass.}$ %	P_2O_5 water.%	CaO_{total}%	CaO water.%	N.%
Norm H_2SO_4 from stoichiometry for CaO decomposition, 30%						
100 : 10	5,29	1,89	0,21	14,41	1,43	2,20
100 : 20	6,39	2,24	0,29	18,36	2,04	1,76
100 : 25	6,79	2,32	0,36	19,81	2,30	1,60
100 : 30	7,12	2,41	0,43	21,01	2,61	1,47
100 : 40	7,64	2,51	0,52	22,91	3,05	1,26
Norm H_2SO_4 from stoichiometry for CaO decomposition, 40 %						
100 : 10	5,22	2,40	0,32	14,22	2,82	2,17
100 : 20	6,26	2,79	0,45	17,99	3,91	1,72
100 : 25	6,63	2,90	0,52	19,35	4,40	1,56
100 : 30	6,94	2,97	0,60	20,48	4,86	1,43
100 : 40	7,42	3,08	0,70	22,24	5,63	1,22
Norm H_2SO_4 from stoichiometry for CaO decomposition, 50 %						
100 : 10	5,16	2,99	0,73	14,04	3,96	2,14
100 : 20	6,13	3,41	0,98	17,63	5,32	1,69
100 : 25	6,48	3,52	1,10	18,91	5,94	1,53
100 : 30	6,77	3,57	1,23	19,97	6,43	1,40
100 : 40	7,21	3,73	1,46	21,62	7,36	1,19
Norm H_2SO_4 from stoichiometry for CaO decomposition, 60 %						
100 : 10	5,09	3,49	1,18	13,87	5,06	2,11
100 : 20	6,01	4,00	1,52	17,29	6,58	1,66
100 : 25	6,34	4,10	1,68	18,50	7,13	1,50
100 : 30	6,60	4,13	1,81	19,49	7,74	1,36
100 : 40	7,02	4,29	2,05	21,03	8,86	1,16
Norm H_2SO_4 from stoichiometry for CaO decomposition, 70 %						
100 : 10	5,03	3,92	1,62	13,69	5,96	2,09
100 : 20	5,90	4,47	2,02	16,95	7,71	1,63
100 : 25	6,20	4,60	2,17	18,10	8,44	1,46
100 : 30	6,45	4,75	2,35	19,03	9,11	1,33
100 : 40	6,83	4,86	2,61	20,47	10,11	1,13

acid 30% of stoichiometry produces an organomineral fertilizer containing $P_2O_{5total.}$ – 5,29 %; $P_2O_{5ass.}$by limit conc – 1,89 %, $P_2O_{5ass.}$: $P_2O_{5total.}$ – 35,68 %; $P_2O_{5water.}$: $P_2O_{5total.}$ – 3,98 %; $CaO_{total.}$ – 14,41 %; $CaO_{water.}$ – 1,43 %, $CaO_{water.}$: $CaO_{total.}$ – 9,94 %, organic matter – 42,92%; humic acids – 5,73%, fulvo acid -14,03%, water soluble organic matter - 4,0%, $SO_{3общ}$. – 3,41%, $SO_{3вод}$. – 1,11%, азот – 2,20%. With the same ratio of WWS to the mineralized mass, but with a norm of acid of 70%, a fertilizer containing $P_2O_{5total.}$ – 5,03 %; $P_2O_{5ass.}$by limit conc – 3,92 %; $P_2O_{5ass.}$: $P_2O_{5total.}$ – 77,98 %; $P_2O_{5water.}$: $P_2O_{5total.}$ – 32,12 %; $CaO_{total.}$ – 13,69 %; $CaO_{water.}$ –5,96 %, $CaO_{water.}$: $CaO_{total.}$ – 43,51 %, organic matter – 40,80%; humic acids – 5,44%, fulvo acid – 13,33%, water soluble organic matter– 3,80%, SO_{3total}. – 7,31%, SO_{3water}. – 2,02%, nitrogen – 2,09%.

At the request of agriculture, phosphorus fertilizer should have a high content of total and assimilable forms of P_2O_5, and the relative content of water-soluble forms of P_2O_5 should be at least

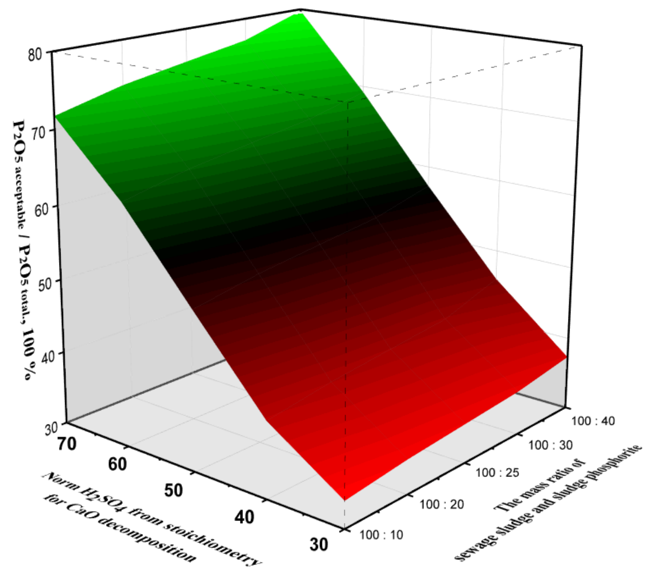
Table 4. The composition of organic fertilizer obtained by activation of the mineralized mass with sulfuric acid and WWS

The mass ratio of WWS to phosphorite	Organicmatter%	FulvoAcid%	humicacids, %	water soluble organic matter e%	$SO_{3total,}$ %	$SO_{3\ water,}$ %
Norm H_2SO_4 from stoichiometry for CaO decomposition, 30 %						
100 : 10	42,92	14,03	5,73	4,00	3,41	1,11
100 : 20	34,40	11,24	4,59	3,21	5,46	1,89
100 : 25	31,29	10,23	4,18	2,92	6,21	2,20
100 : 30	28,70	9,38	3,83	2,67	6,83	2,54
100 : 40	24,62	8,05	3,29	2,29	7,82	3,09
Norm H_2SO_4 from stoichiometry for CaO decomposition, 40 %						
100 : 10	42,37	13,85	5,65	3,95	4,42	1,38
100 : 20	33,69	11,01	4,50	3,14	7,03	2,35
100 : 25	30,57	9,99	4,08	2,85	7,97	2,77
100 : 30	27,97	9,14	3,73	2,61	8,75	3,10
100 : 40	23,90	7,81	3,19	2,23	9,97	3,66
Norm H_2SO_4 from stoichiometry for CaO decomposition, 50 %						
100 : 10	41,84	13,67	5,58	3,90	5,41	1,60
100 : 20	33,03	10,79	4,41	3,08	8,53	2,67
100 : 25	29,88	9,76	3,99	2,78	9,65	3,13
100 : 30	27,28	8,91	3,64	2,54	10,57	3,51
100 : 40	23,24	7,59	3,10	2,17	12,01	4,22
Norm H_2SO_4 from stoichiometry for CaO decomposition, 60 %						
100 : 10	41,32	13,50	5,51	3,85	6,37	1,80
100 : 20	32,38	10,58	4,32	3,02	9,98	2,93
100 : 25	29,22	9,55	3,90	2,72	11,26	3,55
100 : 30	26,62	8,70	3,55	2,48	12,31	4,12
100 : 40	22,60	7,39	3,02	2,11	13,94	4,84
Norm H_2SO_4 from stoichiometry for CaO decomposition, 70 %						
100 : 10	40,80	13,33	5,44	3,80	7,31	2,02
100 : 20	31,76	10,38	4,24	2,96	11,37	3,01
100 : 25	28,59	9,34	3,81	2,66	12,80	3,31
100 : 30	25,99	8,49	3,47	2,42	13,96	3,42
100 : 40	22,00	7,19	2,94	2,05	15,76	3,60

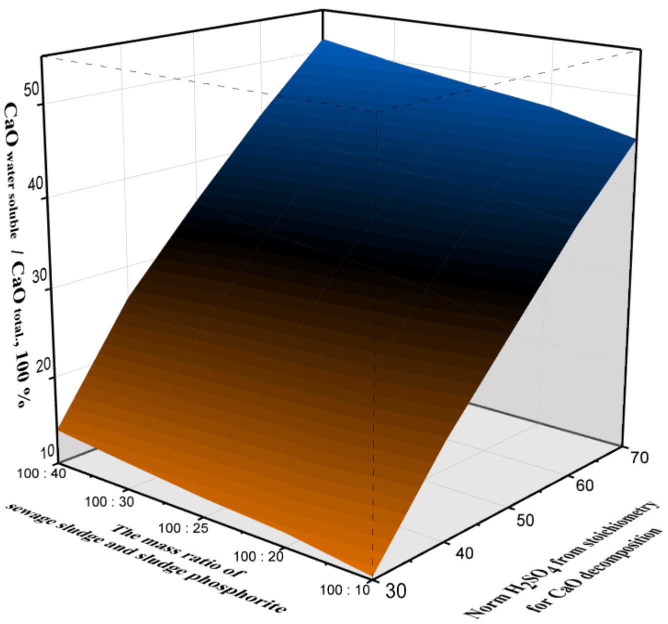
50%.Based on this requirement, the optimal norm of sulfuric acid for the decomposition of MM is 50% of stoichiometry, and the optimal ratio of WWS: MM can be considered 100: 30, at which the relative content of P2O5ass. is 52.71%.

In this organic fertilizer using MM has the composition(weight. %):total – 6,77 %; $P_2O_{5ass.}$bylimitconc– 3,57%; $P_2O_{5ass.}$:$P_2O_{5total.}$ – 52,71%; $P_2O_{5water.}$: $P_2O_{5total.}$ – 18,14%; total – 19,97 %; $CaO_{water.}$ –6,43 %, $CaO_{water.}$: $CaO_{total.}$ – 32,21%, organic matter – 27,28%; humic acids – 3,64%, fulvo acid -8,91%, water soluble organic matter – 2,54%, SO_{3total}. – 10,57%, SO_{3water}. – 3,51%, nitrogen – 1,40%.

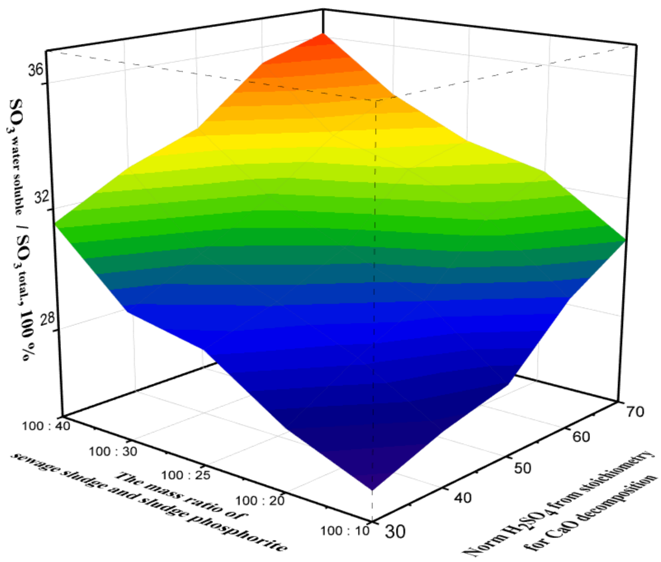
TEST Engineering & Management
January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847



Pic. 1. The dependence of the change in the assimilable form of P_2O_5 by lim. to those from the norm of sulfuric acid and the mass ratio of WWS to MM



Pic. 2. Dependence of the change in the water-soluble form of CaO on the norm of sulfuric acid and the mass ratio of WWS to MM



Pic. 3. Dependence of the change in the water-soluble form of SO_3 on the norm of sulfuric acid and the mass ratio of WWS to MM

IV. CONCLUSION

Thus, the conducted studies convincingly show that, based on sewage sludge after dehydration or without it, using a small amount of sulfuric acid or other mineral acids used in the production of mineral fertilizers, it is possible to intensively process sewage sludge and sludge phosphorite into organomineral fertilizers

.

Bibliography

1. Kulikova A.X., Zaxarov N.G., Pochinova T.V., The use of sewage sludge as a fertilizer in agriculture of the Ulyanovsk region.AgrochemicalBulletin. №-5. 2010. – p. 32-35.

2. Dogadina M.A. Environmental assessment of the impact of non-traditional fertilizers on the properties of dark gray forest soils.Theoretical and Applied Ecology№ 1. 2017. – p. 69-76.

3. Vinogradov D.V., Vasileva V.M., Makarova M.P., Kochurov B.I., Lupova Ye.I. Agroecological action of sewage sludge and its mixtures with zeolite on agrocenoses of oilseeds.TheoreticalandAppliedEcology№ 3. 2019. – p. 127-133.

4. Patent № 2142930 C1 Russia. Kl. CO5F7/00, The method of obtaining organic fertilizer from sewage sludge // K.M. Elkind,

January-February 2020
ISSN: 0193-4120 Page No. 15839 - 15847

I.G.Trunova, V.M. Smirnova, K.N.Tishkov, Ch.A. Dziminskak– from 20.12.2009.

5. Patent № 2264998 C1 Russia. Kl.CO5F7/00, The method of obtaining organic fertilizers from sewage sludge // K.M. Elkind, I.G.Trunova, K.N.Tishkov. – from 29.03.2009.

6. Patent № 2039726 C1 Russia. Kl.CO5F7/00, The method of obtaining organic fertilizers // V.G. Petrov, Ye.S. Myaxnov, V.P. Semakin – from 20.07.1995.

7. Patent № 2478088 C1 Russia. Kl. CO5F7/00, The method of obtaining organic fertilizers from sewage sludge // V.A. Xramov, A.A.Yefremov –from 26.07.2011.

8. Patent № 2514221 C1 Russia. Kl. CO5F7/00, The method of obtaining organic fertilizers from sewage sludge // I.A. Kashtanov, I.V. Butusov, D.V. Bondar – from 27.04.2014.

9. Grigorev V.V., Sirchina N.V., Terentev Yu.N. New approaches to the production of granular organic fertilizer based on sewage sludge. Journal of Environmental Protection. Human ecology. 2018. – p. 16-19.

10. Yeskov A.I., Novikov M.N. Problems of production and use of organic fertilizers // Agrochemical Bulletin. – 1998. - № 4. – p. 29-32.

11. Boboxodjaev I. Humus and soil fertility//Agriculture of Uzbekistan. – 1992. - № 8-9. – p. 15-16.

12. Shevsova L.K., Volodarskaya I.V. The effect of prolonged use of fertilizers on the balance and quality of humus // Chemicalization of agriculture. – 1991. - № 11. – p.97-101.

13. Derjavin L.M., Sedova Ye.V. On the issue of reproduction of humus //Agrochemistry. – 1988. - № 9. – p. 117-127.

14. FokinA.D., ChernikovaI.L., ChernikovV.Ye. The use of phosphorus from plant residues and mineral fertilizers in some parts of the crop rotation on sod-podilithic soils // News of the Timiryazev Agricultural Academy. - 1980. - № 3.– p. 69.

15. Shevsova L.K., Volodarskaya I.V. The effect of prolonged use of fertilizers on the balance and quality of humus // Chemicalization of agriculture. – 1991. - № 11. – p.97-101.

16. Organic fertilizer. Directory / P.D.Popov, V.I.Xoxlov, A.A.Yegorovand etc. – M.: Agropromizdat, 1988. – 207p.

17. U.Sh.Temirov, A.M.Reymov, Sh.S. Namazov, N.H. Usanbaev, Seytnazarov A.R. Organic-mineral fertilizer based on cattle manure and sludge phosphorite with superphosphate. // International Journal of Recent Advancement in Engineering & Research. Volume 04, Issue 01. India. – January – 2018 – pp. 39-46.

18. U.Sh.Temirov, Sh.S. Namazov, N.H. Usanbaev, B.E. Sultonov, A.M. Reymov. Organic-mineral Fertilizer Based on Chicken Manure and Phosphorite from Central Kyzylkum // Chemical Science International Journal. Volume 24, Issue 3. USA. – 2018. – pp. 1-7.

19. Shafoat Namazov, Uktam Temirov, Najimuddin Usanbayev. Research of the Process of Obtaining Organo-Mineral Fertilizer Based on Nitrogen Acid Decomposition of Non-Conditional Phosphorites of Central Kyzylkumes and Poultry Cultivation Waste // International Journal of Innovative Technology and Exploring Engineering (IJITEE). Volume 8, Issue 12. India. – 2019. – pp. 2260-2265.

20. A.A. Asrorov, N.A. Doniyarov, U.Sh. Temirov, N.X. Usanbaev, I.A. Tagaev, K.Sh. Xusenov. Organomineral fertilizers based on precipitation of sewage and substandard phosphorites of Central Kyzylkum. // Composite materials scientific and technical and production journal: – Tashkent, 2019. – № 3 – p. 43-47.

21. Doniyarov N.A., Tagayev I.A. Obtaining a new kind of organic fertilizer on the basis of low-grade phosphorite of Central Kyzylkum // RMZ. Materials and Geoenvironment. Materiali in geookolje. – Slovenia. Univerzav Ljubljana, 2018. – P. 1-9.

22. Dragunov S.S. Methods of analysis of humic fertilizers // Humic fertilizers. Theory and practice of their application. – Xarkov: Publishing House of Kharkiv State University, 1957. – p. 42-55.