INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGIES
www.journalsresearchparks.org/index.php/IJOT e- ISSN: 2615-8140|p-ISSN: 2615-7071
Volume: 03 Issue: 04 | April 2021

Production of NP Fertilizers Based on Local Raw Materials

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ABSTRACT: Phosphorites S.K are the main phosphate raw materials for the factories of Uzbekistan producing phosphorus-containing fertilizers. The article presents the kinetics of decomposition of phosphorites S.K. sulfuric and extraction phosphoric acids.

According to the data obtained, most of the phosphorite (52-65%) decomposes within 10 minutes, and then the process of opening the phosphate is sharply measured. With an equal total rate of acids, an increase in the proportion of sulfuric acid contributes to a deeper decomposition of phosphate. For 3 hours of interaction, an increase in the amount of sulfuric acid contributes to an increase in the degree of opening of the fossil raw material from 83.9 to 90.1%, at a process temperature of 80 ° C at 90 ° C from 89.8 to 93%.

KEYWORDS: complex fertilizers, sulfuric acid, reagent, phosphates temperature, acid rate, decomposition kinetics

Introduction

When obtaining complex nitrogen-phosphorus fertilizers containing calcium and sulfur in their composition, by disrupting the phosphate raw material with sulfuric, extraction phosphoric acids, the rate of interaction of the reagents largely depends on the ratio of acids for the opening of phosphate.

The amount of each acid was calculated for the opening of calcium and magnesium minerals of the phosphate raw material for the formation of sulfates and dihydrogen phosphates of calcium and magnesium, aluminum and iron compounds - to sulfates and basic phosphates. The responses were carried out in a thermostated reactor. In which acids were first introduced, and then phosphorite was introduced within 2-3 s. After a specified period of time, the process was stopped by introducing n-butyl alcohol in chilled water, and the content was analyzed.

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Table 1.

Decomposition of phosphorite influence of the ratio of acid H2SO4: EPA and temperature on the rate.

Time min.	Decomposition degree (%) at a ratio of c-t (%) and (^{0}C)					
	70:50		60:60		50:70	
	80	90	80	90	80	90
1	37,09	41,12	33,17	39,61	30,81	38,77
3	44,35	48,79	40,74	45,57	38,00	48,28
5	50,77	54,59	46,05	53,94	43,87	51,19
10	58,97	65,37	55,07	57,00	52,38	55,00
15	64,34	71,92	57,97	61,60	55,82	58,33
30	68,93	80,69	63,44	60,28	59,57	63,29
60	71,20	84,56	65,37	71,47	62,43	69,76
90	74,56	88,62	69,03	79,16	66,29	75,08
120	81,27	91,30	75,96	85,72	73,24	82,95
180	90,08	33,00	85,47	21,55	83,76	89,83

Influence of the ratio of acids H2SO4: EPA and temperature on the rate of decomposition of phosphorite SK.

According to the data obtained, most of the phosphorite (52-65%) decomposes within 10 minutes, and then the process of opening the phosphate is sharply measured. With an equal total rate of acids, an increase in the proportion of sulfuric acid contributes to a deeper decomposition of phosphate. For 3 hours of interaction, an increase in the amount of sulfuric acid contributes to an increase in the degree of opening of the fossil raw material from 83.9 to 90.1%, at a process temperature of 80 ° C at 90 ° C from 89.8 to 93%.

The character of the slope of the isochron isotherm curves shows that at the beginning of the process during the reaction time of 1 and 5 min, the reaction temperature plays a more significant role in the rate of decomposition of phosphorite, in the middle stage of the process (30-90 min) the value of acids prevails, and at the end of the process the temperature is again more significant interaction of reagents.

Table 2.

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Results of processing the kinetic parameters of the decomposition of Karatau phosphorite with sulfuric and extraction phosphoric acids

Time min.	70:50				60:60				50:70			
	80		90		80		90		80		90	
	$\ln\frac{a}{\frac{a-x}{t}}$	$\frac{x}{t}$	$\ln\frac{a}{\frac{a-x}{t}}$	$\frac{x}{t}$	$\ln\frac{a}{\frac{a-x}{t}}$	$\frac{x}{t}$	$\ln\frac{a}{\frac{a-x}{t}}$	$\frac{x}{t}$	$\ln\frac{a}{\frac{a-x}{t}}$	$\frac{x}{t}$	$\ln\frac{a}{\frac{a-x}{t}}$	$\frac{x}{t}$
1	0,5122	37,09	0,5833	41,12	0,4906	33,17	0,5663	39,61	0,4582	30,51	0,5642	38,77
3	0,2258	14,78	0,2476	16,26	0,2156	13,58	0,2293	15,19	0,2012	12,67	0,2261	14,76
5	0,1657	10,15	0,1766	10,92	0,1546	9,21	0,1777	10,79	0,1482	8,77	0,1634	10,23
10	0,1062	5,90	0,1212	6,54	0,1033	5,51	0,0973	5,70	0,0981	5,24	0,0946	5,50
15	0,0834	4,29	0,0988	4,79	0,0755	3,86	0,0744	4,11	0,0749	3,72	0,0697	3,89
30	0,0482	2,30	0,0673	2,69	0,0451	2,11	0,0429	2,21	0,0414	1,99	0,0406	2,11
60	0,0260	4,19	0,0400	1,41	0,0241	1,09	0,0253	1,19	0,0228	1,04	0,0249	1,16
90	0,0165	0,83	0,0339	0,98	0,083	0,77	0,0222	0,88	0,0174	0,74	0,0201	0,83

Where a is the degree of decomposition of phosphorite after 3 hours of interaction

x- degree of decomposition over time

The calculated values of the speed constant and the braking ratio are shown below:

Acid rate, H2SO4	H3PO4	Temperature • round,	1010, 0C	V • 1012 min-1
70	50	80	0.7	1.7
“”	“”	90	1.8	1.6
60	60	80	0.4	1.8
“”	“”	90	1.0	1.6
50	70	80	0.3	1.9
“”	“”	90	0.7	1.6

The results show that at a process temperature of 90 ° C the value of the inhibition coefficient practically does not change, and at 80 ° C it increases with an increase in the proportion of phosphoric acid. The activation energy of the process in the series of norms of acids H2SO4: EPA 70:50, 60:60, 50:70 was 101.53, 97.56, and 90.23 kJ / mol, respectively. These values are comparable to the activation energy of the decomposition of phosphorite Guliob with phosphoric acid, which was 85.83 kJ / mol.

The data obtained allow us to assume that the kinetics of decomposition of phosphorite with sulfuric and extraction phosphoric acids during the production of calcium sulfonate fertilizers will obey the laws of inhibition processes.

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