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Research of the Preparation of an Absorber Based on Zinc Oxide

Tavashov Shahzod Khujahmatovich, Farmanov Behzod Ilhomovich

Assistent, Karshi Engineering-Economics Institute, Karshi, Uzbekistan
Senior lecture, Karshi Engineering-Economics Institute, Karshi, Uzbekistan

ABSTRACT: The results of studies on the preparation of the used catalyst GIAP-10 absorber are presented. Decomposition at a rate of 120% nitric acid 30%, temperature 95°C, leaching time 3 hours, before precipitation of zinc hydroxide carbonate from the resulting zinc nitrate solution with a precipitant solution with ammonium carbonate at pH medium (8.0-10.0), temperature 65 -70°C and the time is 1 hour. The obtained zinc hydroxide carbonate was dried at a temperature of 120°C, 2 hours and calcined at 500°C, 5 hours until it was converted to zinc oxide. Preparation of a scavenger based on zinc oxide in the form of a granule with the use of various binder and additives and amounts. Studied the effect of different amounts of binding additives on physical and chemical parameters. With an increase in the amount of binding additives CuO from 5% to 10% and MgO 7%, the degree of increase in the bulk density from 0.95 g/cm^3 to 1.02 g/cm^3, the mechanical strength: the index of splitting strength increases from 0.37 kg/mm to 0.41 kg/mm and specific surface area from 93.1 m^2/g to 97.8 m^2/g.

KEYWORDS: preparation, catalyst GIAP-10, absorber, nitric acid, zinc nitrate, temperature, an hour, pH, zinc hydroxide carbonate, zinc oxide, the bulk density, the mechanical strength, specific surface area.

I. INTRODUCTION

Natural gas is purified from sulfur compounds by absorption, followed by removal of H_2S from the regeneration gases to obtain sulfur by the Claus method and fine purification on zinc oxide absorbers [1].

Zinc oxide absorbers are designed for fine purification of natural gas from sulfur compounds. Used absorbers are replaced with fresh ones after saturation with sulfur. One-time loading of desulfurization devices in the chemical industry will require hundreds of tons of zinc oxide absorbers. Absorbers discharged from the apparatus are production waste. More than 1000 tons of waste absorber have been accumulated at domestic enterprises of the chemical industry [2].

II. SIGNIFICANCE OF THE SYSTEM

The article presents the results of studies to the effect of different amounts of binding additives on physical and chemical parameters The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. LITERATURE SURVEY

Previously studied samples of absorbers of sulfur compounds obtained in laboratory conditions from spent absorbers, the content of the mass fraction of zinc oxide is 89.8% and 88.1%, magnesium oxide is 7.4% and 6.8%, respectively, from absorbers from JSC “Maksam- Chirchik” and with JSC “Fergana-Azot”, at a rate of 85.0% ZnO and 5-8% MgO. The bulk density in the samples is 0.98 g/dm^3 and 0.83 g/dm^3 at a rate of (1.1÷1.4) g/dm^3. Splitting strength index is equal to 0.71 kg/mm and 0.46 kg/mm with a norm of not more than 0.7 kg/mm and not less than 0.35 kg/mm. The specific surface area in the obtained samples of absorbers of sulfur compounds is 64.0 m^2/g and 64.6 m^2/g at a rate of at least 20.0 m^2/g, respectively, for absorbers from JSC “Maksam-Chirchik” and JSC Ferganaazot, which meets the requirements of KSt 6.3-97: 2005 [4].

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IV. METHODOLOGY

In the studies applied methods of the preparation of the absorber in laboratory conditions was molded on a manual syringe press based on zinc oxide in the form of granules (cylindrical) with the use of various binders and additives and the amount was mixed for 30 minutes. Before the formed mass has an elastic-plastic-viscous property. The molding mass is prepared from ZnO (act) sifted through a sieve with aperture size of 1 mm. Strengthening additives were used CuO, MgO, Al_2O_3, high-alumina cement, etc. to obtain absorbers in the form of granules. Drying was carried out in a muffle furnace at a temperature of 120℃ for 3 hours.

V. EXPERIMENTAL RESULTS

We studied the effect of different amounts of binding additives on the physicochemical parameters of the absorbers of sulfur compounds (bulk density, mechanical strength and specific surface area) of the obtained absorbent.

The table shows the results of studies of the effect of binding additives on the degree of increase in physicochemical and mechanical indicators (bulk density, mechanical strength and specific surface area) of absorbers of sulfur compounds based on zinc oxide with the addition of various amounts of binding additives.

Table

Effect of different amounts of binding additives on the physicochemical parameters of the absorber

№	The name of indicators	Synthesized absorber sample						
		№1	№2	№3	№4	№5	№6	№7
1	Mass fraction of ZnO, %	95	93	90	85	88	86	83
2	Mass fraction of CuO, %	-	-	7	10	5	7	10
3	Mass fraction of MgO, %	5	7	3	5	7	7	7
4	Dimensions outer diameter of granules, mm	6,2	6,2	6,2	6,3	6,2	6,1	6,2
5	Bulk density, g/cm^3	1,01	1,04	1,17	1,25	0,95	0,99	1,02
6	Mechanical strength: splitting strength index, kg/mm, granule diameter not less average-0.7 minimum -0.35	0,34	0,37	0,35	0,38	0,37	0,39	0,41
7	Specific surface, m^2/g	75,2	78,7	80,3	85,7	93,1	95,3	97,8

Further, the influence of the amount of binding additives CuO and MgO on the degree of increase in the physicochemical and mechanical parameters (mechanical strength and specific surface) of the absorber of sulfur compounds was investigated when adding an additive of CuO from 5% to 10% and MgO 7%. The results are shown in Figures 1 and 2.

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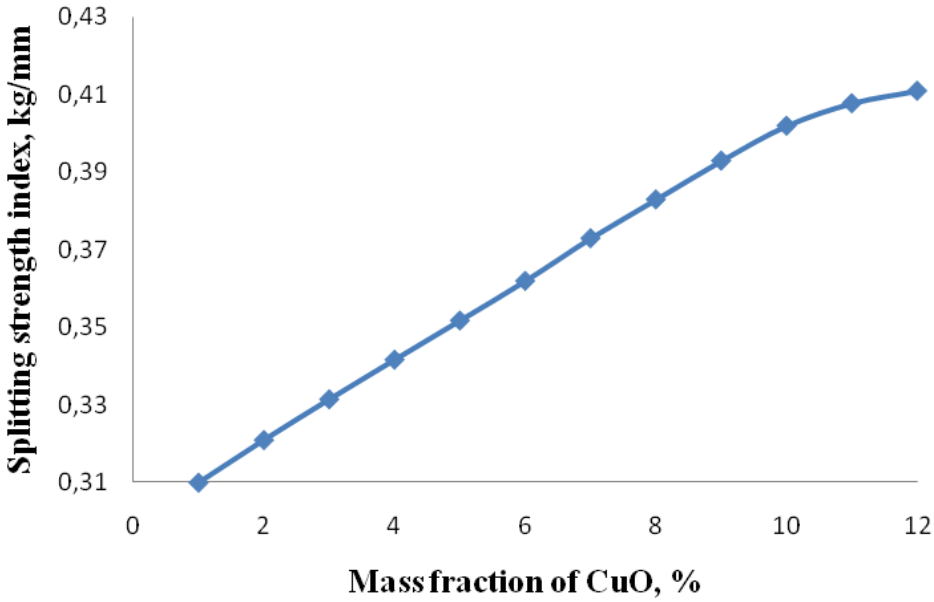

Figure 1. Influence of CuO on the degree of increasing the splitting strength index

Increase in the amount of CuO from 5% to 10% and MgO 7% on the degree of increase in mechanical strength: splitting strength of absorbers of sulfur compounds based on ZnO from 0.37 kg/mm to 0.41 kg/mm.

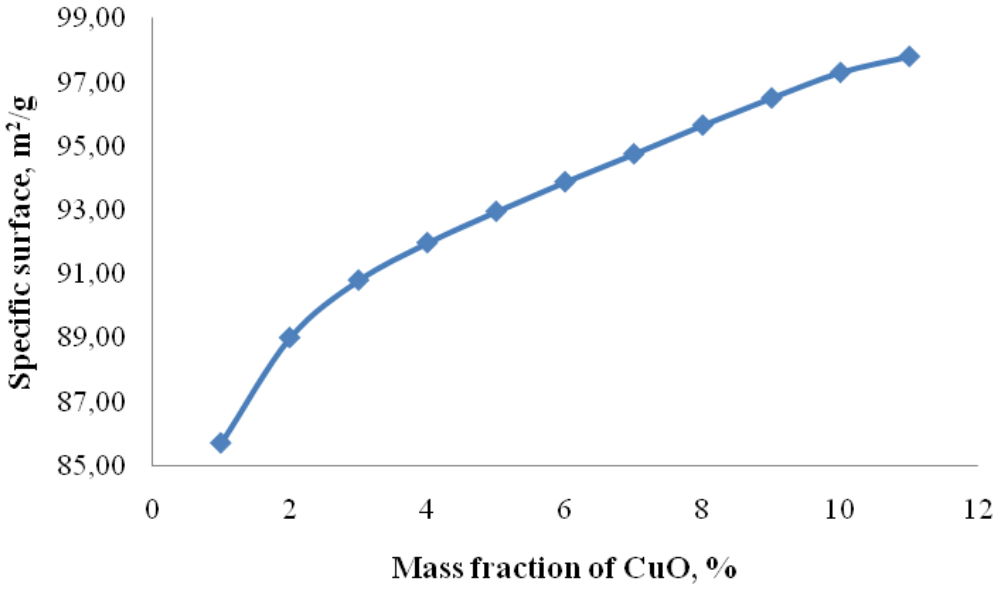

Figure 2. Influence of CuO on the degree of increase in the specific surface area of the absorber.

It can be seen that with an increase in the amount of CuO by the degree of increase in the specific surface of the absorber from 93.1 m^2/g to 97.8 m^2/g. Therefore, for further research, the amount of binding additives CuO 10% and MgO 7% was limited.

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IV. CONCLUSION

From the data obtained, it is possible to obtain an absorber with added CuO 10% and MgO 7% improves the physicochemical indicators for mechanical strength: the splitting strength index increases by 0.41 kg/mm and the specific surface area is 97.8 m^2/g.

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