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Study of Efficiency of Hydrogen-Fluorite (2HF) Gas Cleaning in Inertial Scrubber

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Abstract
The article examines the physical and chemical properties of secondary gases coming out of chemical industry enterprises to the environment and solves the problems of gas disposal based on their scale.
Secondary gas was selected for experiments and laboratory analyzes were performed. Based on the results obtained in the experiments, the optimal parameters of the device for different values of variable factors are based.

Keywords: aerosols, absorbent, hydrogen-fluoride gas, calcium technical white soda, calcium carbonate soda, technical shampoo.

Introduction

Today, thousands of tons of dust and secondary gases with various toxic properties are emitted into the atmosphere from ferrous and non-ferrous metallurgy, chemical and petrochemical, construction industry, energy and fuel industry. This situation has a negative impact on the environmental condition of the areas where industrial enterprises are located, as well as the deterioration of working conditions and sanitary conditions. Therefore, it is important to clean dust and secondary gases generated in the production processes of industrial enterprises, to reuse them in production processes, and to eliminate environmental problems [1-7].
The density, dispersion, adhesion properties, abrasiveness, wetting properties, electrical conductivity, shape of dust particles of industrial dust (aerosols) based on their physico-chemical properties, it is necessary to find a solution for the creation of devices and new types of devices on the basis of research. remains one of the issues [7-15].
Therefore, it is desirable to use new effective methods or the effect of external energy to increase the collision probability of dust and secondary gases with liquid droplets [15-28].
Therefore, the following results were obtained in a series of experiments conducted to determine the effective absorption of hydrogen-fluoride gas into the absorbent liquid and to determine the efficiency of cleaning the device. Experimental studies were calculated using K.T.Simrau's experimental method [28-34].

Water is added to the composition as a 10% solution in the absorbent.

1. In technical white soda with calcium - absorption of poisonous gas into liquid is up to 87.4÷92.6% in the range of gas speed 7÷25.6 m/s.
2. Calcium carbonate soda - absorption of poisonous gas into liquid is up to 81.8÷86.5% at a gas speed of 7÷25.6 m/s.

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2. Technical shampoo - absorption of poisonous gas into liquid is 78.9÷84.7% in the range of gas speed 7÷25.6 m/s [33].

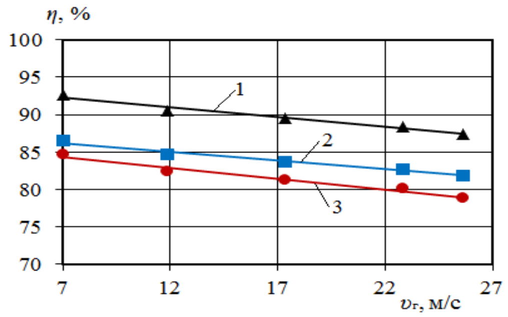
Water is added to the composition as a 20% solution in the absorbent.

1. In technical white soda with calcium - gas velocity in the range of 7÷25.6 m/s, absorption of poisonous gas into liquid is up to 93.4÷98.9%.
2. Calcium carbonate soda - absorption of poisonous gas into the liquid is up to 84.7÷92.7% at a gas speed of 7÷25.6 m/s.
2. Technical shampoo - absorption of poisonous gas into liquid is 81÷88.5% in the range of gas speed 7÷25.6 m/s. [25]

Water is added to the composition as a 30% solution in the absorbent.

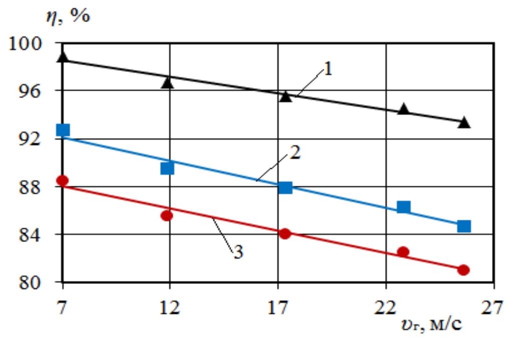
1. In technical white soda with calcium - absorption of poisonous gas into liquid is up to 96.1÷99.4% in the range of gas speed 7÷25.6 m/s.
2. Calcium carbonate soda - the absorption of poisonous gas into the liquid is 94÷97.3% in the gas velocity range of 7÷25.6 m/s [33].
2. Technical shampoo - absorption of poisonous gas into liquid is up to 90.4÷95.6% in the range of gas speed 7÷25.6 m/s.

Based on the obtained experimental results, a graph of the dependence of the cleaning efficiency of the device on the speed of the gas supplied to the device was constructed. The experimental results are presented in Figures 1–2–3 [33].



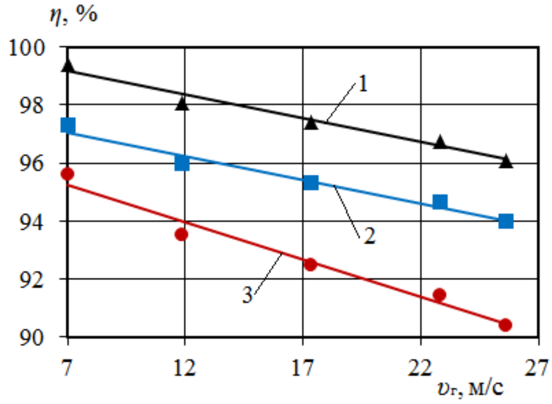
1 in a 10% solution of calcium technical white soda in water; 1-in a 10% solution of calcium carbonate soda in water; 1 in a 10% solution of technical shampoo in water;

Figure 1. Cleaning efficiency *η* to the gas velocity of V_r dependence



1-calcium in a 20% solution of technical white soda in water; 1-in a 20% solution of calcium carbonate soda in water; 1 in a 20% solution of technical shampoo in water;

Figure 2. Cleaning efficiency *η* to the gas velocity of V_r dependence



1 in a 30% solution of calcium technical white soda in water; 1-in a 30% solution of calcium carbonate soda in water; 1 in a 30% solution of technical shampoo in water;

Figure 3. Cleaning efficiency η to the gas velocity of V_r dependence

Using the method of least squares, the following empirical formulas were obtained for the graphic dependences presented in Fig. 2-3 [25].

Water is added to the composition as a 10% solution in the absorbent.

y = 94.122e-0.003x R^2 = 0.9741 (1)
y = 87.873e-0.003x R^2 = 0.974 (2)
y = 86.417e-0.004x R^2 = 0.9744 (3)

Water is added to the composition as a 20% solution in the absorbent.

y = 100.51e-0.003x R^2 = 0.9741 (4)
y = 95.11e-0.004x R^2 = 0.9749 (5)
y = 90.756e-0.004x R^2 = 0.9749 (6)

Water is added to the composition as a 30% solution in the absorbent.

y = 100.35e-0.002x R^2 = 0.9734 (7)
y = 98.246e-0.002x R^2 = 0.9734 (8)
y = 97.119e-0.003x R^2 = 0.974 (9)

When the device was used to clean hydrogen-fluoride gas and air-containing phosphoride dust in mixing reactors during the production of superphosphate, the test results showed that the cleaning efficiency was 5.7% higher than that of the existing wet cleaning scrubber. and the neutrality (Ph) of the waste water produced during the treatment process increased from 5.4 to 9.9.

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