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ANALYSIS OF METHODS OF NEUTRALIZATION OF CHLORINECONTAINING EMISSION FOR PRODUCTION FOR SPONGY TITAN

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The basic methods of cleaning from the chlorinecontaining toxic matters of waste gases for production of spongy titan are considered. The use of sodium hydroxide for catching of connections of chlorine, appearing in a foregoing production is reasonable.

Keywords: spongy titan, waste gases, chlorinecontaining emission, cleaning methods, sodium hydroxide

By basic raw material for smelting of titan is ilmenite concentrate. Melting of concentrate is executed in electrical-arc furnaces. A titanic slag, containing large quantity of titania, appears as a result of chemical reaction.

Chlorinating of the got slag is carried out in shaft chlorinators. at a temperature 800-1250 °C. Other variant foresees chlorinating in fusion of salts for alkaline metals of *NaCl* and *KCl*.

The got titan tetrachloride is reduced with use magnesium in the special impermeable furnaces-retorts and a titanic sponge get. Further titanic sponge sinters or re-fuse in a compact metal in a vacuum or inert atmosphere.

At the production of spongy titan chlorinecontaining emission is appeared as chlorine, chloride of hydrogen, phosgene, tetrachloride silicon and tetrachloride titan, and also oxychloride titan.

For neutralization of chlorinecontaining emission apply cleaning by technical water; calcium hydroxide of and sodium hydroxide.

In the process of irrigation of chlorinecontaining emission by technical water in scrubbers there is its chemical co-operating with components of gas phase. Thus, first of all, there are catch chloride of hydrogen, tetrachloride silicon and tetrachloride titan, oxychloride titan and only after their total-absorption cleaning from chlorine begins. A phosgene and dioxide of carbon is not catch by technical water.

Cleaning of chlorinecontaining emission for production of spongy titan, does not allow to catch a phosgene by technical water, it has subzero efficiency at catching of chlorine (within the limits of 10 %). Used solution of muriatic acid has a subzero concentration (to 20 %) and contaminates products of other reactions and particulate matters.

At irrigation of chlorinecontaining emission calcium hydroxide a catching order remains the same, as well as in the first method, however this method allows to execute cleaning from a phosgene and carbon dioxide:

The high concentration of carbon dioxide (CO_2) in technological gases results in formation of largy quantity of insoluble calcium carbonate ($CaCO_3$) that results in

the rapid wearing-out of absorbent.

Irrigation of scrubbers in this method is also executed on the reserved and continuous cycle. During work of gas-purification with the use of calcium hydroxide it is necessary constantly to control its content in solution, shutting out the decline of him a less than 20 g/dm^3 (in term on *CaO*). It is related to that the reactions of formation of free chlorine take place at its content of the below said value, and also high-toxic calcium chlorate.

At cleaning of chlorinecontaining emission large quantity of insoluble calcium carbonate ($CaCO_3$) appears by hydroxide calcium that results both in the rapid wearing-out of absorbent and to the rapid wear of pumps, and also loading in sprayers and communications.

At irrigation of chlorinecontaining emission by sodium hydroxide a catching order remains the same, as well as at the use of calcium hydroxide and also it allows to carry out cleaning from a phosgene and carbon dioxide on reactions:

$$2NaOH + Cl_2 \Rightarrow NaOCl + NaCl + H_2O \quad (1)$$

$$NaOH + HCl \Rightarrow NaCl + H_2O \quad (2)$$

$$4NaOH + TiCl_2 \Rightarrow TiO_2 + 4NaCl + 2H_2O \quad (3)$$

$$4NaOH + SiCl_4 \Rightarrow Si\ \ OH\ _4 + 4NaCl \quad (4)$$

$$4NaOH + COCl_2 \Rightarrow 2NaCl + Na_2CO_3 + 2H_2O \quad (5)$$

$$4NaOH + TiOCl_2 + H_2O \Rightarrow Ti\ \ OH\ _4 + 2NaCl \quad (6)$$

Carbon dioxide of partly co-operates with the sodium hydroxide on a reaction:

$$CO_2 + 2NaOH \Rightarrow Na_2CO_3 + H_2O \quad (7)$$

An appearing sodium carbonate, in turn, is an absorbent for a chlorine and hydrogen chloride:

$$Cl_2 + 2Na_2CO_3 + H_2O \Rightarrow NaOCl + NaCl + 2NaHCO_3 \quad (8)$$

$$HCl + Na_2CO_3 \Rightarrow NaCl + NaHCO_3\ . \quad (9)$$

$$NaClO + 2HCl \Rightarrow NaCl + Cl_2 + H_2O\ . \quad (10)$$

Used alkaline-salt solution is sent on a pipeline in a storage tank and further on an electrolysis. The got alkaline-salt electrolyte is united in the story tank of fresh solution and send to alkaline gas-purification chlorinating as an absorbent. The anodic chlorine of electrolyzer is given on chlorinating, and hydrogen appearing on a cathode, burn.

Cleaning of chlorinecontaining emission does not result by sodium hydroxide in formation of nonsolutes, has high efficiency. Creation of the reserved cycle of the absorbing cleaning results to the decline of content of sodium ions in flows and decline of formation of hard wastes of gas-purification.

Conclusions

1. Basic existent technologies of cleaning of chlorinecontaining emission for

production of spongy titan are investigated. It is shown that high efficiency of catching of chlorine connections is arrived at the use as neutralizer of solution of sodium hydroxide.

2. It is set that deviation of concentration of sodium hydroxide from the set borders toward diminishing results to the decline of cleaning degree for gases, and toward an increase - to the high density and increase of prime cleaning price.

3. Based on the analysis of work of existent gas-purification apparatuses which use sodium hydroxide as an active component, the use of sprayer-type hollow scrubbers is expedient, as nozzle скрубберы even at the use of sodium hydroxide will quickly leading by salts of metals, contained in wastes gases.