
ELUCIDATION OF THE NATURE OF THE OCCURRENCE OF CALCIUM AND IRON COMPOUNDS IN SULFUR DIOXIDE AFTER LUMP SULFUR COMBUSTION FURNACES

© **E.M. Semiryazhko** (LLC Scientific and Production Enterprise Zarya, 93000, Rubizhne, Lugansk region, Zavodskaya st., 1g/36, Ukraine), **D.M. Deineka**, PhD in Technical Sciences, **V.V. Kazakov**, Doctor of Technical Sciences, **Yu.I. Wetzner**, PhD in Technical Sciences (National Technical University "Kharkiv Polytechnic Institute", 61002, Kharkov, Kirpichev str., 2, Ukraine), **V.A. Panasenko**, Doctor of Technical Sciences (SE "State Research and Design Institute of Basic Chemistry", 61002, Mironositskaya St., 25, Kharkov, Ukraine), **A.A. Fandeeva** (NTU "KhPI")

It is known that in the operation of the first layer of the vanadium catalyst for the oxidation of SO_2 to SO_3 in the production of sulfuric acid, the main problem is the rapid increase in the hydraulic resistance of the catalyst due to the ingress of solid impurities in the form of dust from the gas. It has been established that the main component of these impurities are calcium and iron compounds. Therefore, the determination of the main sources of the occurrence of these compounds in sulfuric gas would make it possible to solve the problem of their elimination and improve the performance properties of the catalyst.

The chemical composition of the feedstock in the production of sulfuric acid – granulated sulfur – was studied by X-ray fluorescence analysis for the presence of calcium and iron compounds. It was found that the content of calcium and iron in sulfur was 0,015 wt. %, which is not significant for this production.

The method of X-ray diffraction analysis was used to study the marl-chamotte, chromium-magnesium bricks of the Slavyansk plant and cement used at LLC NPP "Zarya" as, respectively, the lining of the sulfur combustion furnace and for the installation of the lining. As a result of the research, the presence of calcium carbonate was established, and it can be a source of calcium compounds under the operating conditions of a sulfur combustion furnace.

X-ray diffraction studies of spent vanadium catalysts were carried out and it was found that iron precipitates on the catalyst surface in the form of oxide Fe_2O_3 and forms iron-potassium alum in the form of $KFe(SO_4)$ and $[K(Fe,Al)SO_4]_2$ salts both on the surface and in depth of the granules. As a result of the research, it was shown that iron oxide Fe_2O_3 is a corrosion product of the metal part of the combustion furnace equipment and the waste heat boiler.

Based on the studies carried out, recommendations are given in the work to reduce the effect of contamination of the layers of vanadium catalysts: storage and preparation of feedstock, process standards.

Key words: sulfuric acid, sulfur dioxide oxidation, vanadium catalyst, sulfuric gas, sulfur combustion, sulfur combustion furnace, vanadium catalyst fouling.

Corresponding author: Deyneka Dmitry Nikolaevich, e-mail: deynekadn@gmail.com
