

Usenko Yu. ⁽¹⁾, associate professor, c.t.s.

Tarasov V. ⁽²⁾, associate professor, c.t.s.

Kuris Yu. ⁽³⁾, chief scientist, d.t.s.

Kutuzova I. ⁽²⁾, senior teacher

RESEARCH OF POSSIBILITY OF THE USE OF SLUDGES OF HARDWARE PRODUCTION FOR MAKING OF BUILDING GYPSUM

⁽¹⁾ *National metallurgical academy of Ukraine, Dnieper*

⁽²⁾ *Zaporozhe state engineering academy*

⁽³⁾ *Institute of technical thermal physics NASU, Kiev*

The possibility of utilization wastes of sludge's of etching separations of hardware production is studied. The results of tests of the worked out technology of building gypsum making are stated. Realization of the offered technology allows not only to prevent contamination of environment by above mentioned wastes but also get an economy from their utilization

Keywords: hardware production, etching sludge's, treatment, building gypsum, its descriptions

Introduction. Harmful emissions of etching separations of hardware production are substantial problems for ecology of environment, because their accumulation results in degradation and pollution of subsoil waters. There is a necessity of their utilization.

Analysis of achievements/ Next directions of utilization of etching sludge's are known:

1. Liquidation by a burial place in dumps. In world practice the burial place of wastes did not get distribution because of costliness by reason of necessity of pressurizing of dumps and use of considerable areas of fertile earths, and also negative affecting natural environment. The use of the special polygons decides a problem not always, because at drying out of sludge's there is rotting and formation of soluble salts, polluting an environment.

2. Application of fire treatment of exhaust etching solutions and hydrolyzed sulphuric acid. In result, except for sulphureous gas, there is got the powdery iron oxide, which can be used as a red pigment at the production of dyes, and also making of the active cathode masses and polishing powders. However the high degree of cleaning of iron oxide is here needed, that requires considerable power expenses and always advantageously to the businessmen at the middle volumes of emissions;

3. It is known that among sewages of plants of ferrous metallurgy most muddy and harmful are flows of etching separations of hardware production. They appear at treatment solutions of acids, mainly, by a sulfuric acid, surfaces of metal products, covered by a dross and rust. The process of treatment consists in immersion of products in a capacity with solutions of acids and subsequent washing their water. For the making of suitable for the further use sludge produce standard neutralization of etching solutions and particles delete the consequent operations of draining, floatation and filtration measuring more than 5.0 mcm. A granular slag is often used for building of caraways' of high carrying capacity of local level.

4. Sludge's as mineral addition apply at the production of high-quality cement. However the deep cleaning is here required from other admixtures, and also growing shallow to ultra fine fractions, that expensive from considerable capital costs on an equipment and technology and it is practically impossible for an ordinary hardware enterprise.

Basic part of researches. Sludge's of etching separation of the Dnipropetrovsk hardware production amalgamation contain 35-40 % dehydrate of sulfate of calcium ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), 6-7 % quartz (SiO_2) and to 50 % liquid phase, containing 27-28 % sulfate of iron (FeSO_4), which can be used as addition for the making of gaseous binding materials.

To that end a dense remain which is included in the chart of cleaning of sewages of etching separation is sent to mechanical dehydration with the use of pressure filters of type ФПАКМ-24-45К, further give in rolling band dried type of СБЛ-400/600-6. Sediment over of iron hydroxide (II), which appears after existent neutralization, occupies a large volume and has a high hygroscopic, that brings to complication of dissociating from moisture, and also hampers work of sewage treatment plants.

For the making of more dense sediment of sludge-accumulator additionally equipped a distributive device for the serve of air and steam. As a result of airing and subsequent heating of suspension part of iron hydroxide (II) is exposed to oxidization and passes to iron hydroxide (III), which reacts with remaining iron hydroxide (II) and forms crystalline connection – iron oxide (II,III).

Tests in productive conditions showed, that, there is formation of iron oxide (II,III) at pH = 9-10 and temperature 50-60 °C, that is accompanied by the substantial compression of sediment. As a result, it is grows short in 2.5-3.0 time duration of filtration and goes down on a 15-20 % humidity of sludge. The got material well moves away from a filter-mass and does not require an accessory drying on rolling band driers is facilitate possibility of its utilization.

Sludge's containing hydroxide gland (II) rough-dry and close-settled fallouts after filter-presses, maintenance oxide of iron (II,III), added in a different amount to raw material for the production of building gypsum and got the experienced parties of gaseous wares.

The results of researches showed that at addition in the complement of raw material to 10 % sludge, containing iron hydroxide (II), the making of product which on durability factors corresponds to the building gypsum second sort is possible, and at addition in the complement of raw material 20 % close-settled cake, a presence iron oxide (II,III) – corresponds to the building gypsum of first sort.

At addition of sludge's, containing iron hydroxide (II) there is growth of duration of grasping of building gypsum, that is accompanied by the decline of durability of this material.

Additions of cakes, containing the oxide of iron (II,III) the particles of which have a crystalline structure and enhanceable capacity for co-operating with the crystals of building gypsum, accompanied by diminishing of duration of its grasping and increase of durability of gypsum.

Conclusion. The problems of utilization of slime wastes of etching baths of hardware production, which contaminate soil and environment by rotting of dust, are studied. Technology of the use of such sludge's is offered in the production of build materials. The results of researches possibility of the industry use of sludge's of etching separation of hardware production set is real as additions in the complement of raw material of building gypsum. There is at additions to 10 % sludge's, containing iron hydroxide (II), in raw material of building gypsum, get a gypsum second sort, and at additions to 20 % close-settled cakes, containing the iron oxide (II,III) - gypsum of first sort.