Materials of Conferences

THE DEVELOPMENT OF THE METHOD OF THE DUST SUPPRESSION OF THE LEBEDINSK MINE-CONCENTRATING CONCERN'S HILLOCK

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At present an important ecological problem is the atmosphere pollution of the dust-ejection of a mining. One of the concerns exerting a negative influence not only on an environment but on a man is the Lebedinsk mine-concentrating concern, situated on Gubkin. The influence of it upon the environment is evinced by means of dusting the hillocks.

The problem concludes that the hillocks are fine-dispersive enough in its composition and after drying they are easy to be carried over with wind from the hillock's surface, exerting negative influence on an environment and a man not only on the concern's territory but close to the living houses. The hillocks of the Lebedinsk mine-concentrating concern contain in its composition of the order of 70% SiO2, about 10% FeO, 5% oxide Mg, also there are such biogenic elements in its composition as S, P, K, Ca. For an experimental study of the dust-carrying over of the hillocks of the LMCC the experimental plant was modeled and assembled. In the plant a constant speed of wind equal 12m/sec was founded and observed during all experiments.

The dust suppression was brought about two methods: mechanical and biological. Mechanical method concludes in a moistening the hillock's surface to average moisture about 11%.

When the hillocks are in a moist condition, coefficient of the dust-carrying over is insignificant and composes 0, 34%, but in case with the dry hillocks it reaches 7%, it's in 20 times more.

From literature it's known that the biological method of the dust suppression is used in the concern and it spreads only on the slopes of dam, at present it concludes in the usage of the perennial shrubbery plants (sea-buckthorn). In our experimental work it's studied the biological method of the dust suppression of all area of alluvium.

For the decrease of the quantity of the dust-carrying over the hillock's surface the perennial sorts of beans and cereals were used as experimental seedling. The seeds of the cultures were sowed on the hillocks in Petri cups with the different masses: 100, 1000, 5000 kg/he of the hillocks. After the experiments and generalization of the experimental facts it can do a conclusion that the most optimal mass for the dust suppression of the hillock for the area 1 hectare is 1 ton of seedling, the most optimal studied cultures are cereals and it's confirmed with the experimental facts.

As a result it was developed the technological scheme of the inculcation of the seedling in process of the magnetic separation.

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SOLUTION OF SOME ENVIRONMENTAL PROBLEMS OF KURSK MAGNETIC ANOMALY REGION

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Kursk magnetic anomaly (KMA) represents a unique iron ore basin. It is located in Central Black soil economic region of Russia and includes four areas engaged in iron ore mining: Belgorodski, Novooskolski, Starooskolski and Kursko-Orlovski. The total area of Kursk magnetic anomaly is approximately 150 thousand square kilometers. The iron content in the ore is within the limits of 14 to 57%, the greater part of which undergoes preliminary concentration and later is used in metal production. Ore concentration results in a concentrate with prevailing content of ore material and "tailings", consisting mainly of gangue. In Lebedinski mining concentrator (LMK), included into Starooskolski iron ore area of KMA, wet magnetic separation is used for concentration. The resulting "tailings" represent a pulp with the content of solid phase up to 30%, which is transported to the storage area (tailing storage) via pipeline. LMK land allotment, intended for tailing storage is as large as 1520 hectares, which exceeds the areas, allocated for the quarry – 1100 hectares. At present the accumulated volumes of wastes from wet magnetic separation (WMS) are about 80 mln tones. Taking into account the fact that production facilities are located on black soils, which are highly fertile agricultural areas, the problems of protection and rational user of land for Lebedinski mining concentrator are priority issues to be solved.

Judging from chemical and mineralogical composition WMS wastes of Lebedinski MC both currently produced and those from tailing storage are close to weak-ore quartzites. Rock forming mineral is quartz (over 60%), then magnetite (up to 8%), blende horny, iron oxides, pyrite, total iron content is from 10 to 17%. That is the reason that wastes from WMC, being finely dispersed, can be regarded as strongly ironed artificial sands and be used as basic ready made charge to produce pigment filling agents.

The pigments to be used in construction were produced at the department of industrial ecology of

the Belgorod state technological university named after V.G. Shukhov and were made by burning of basic WMC LMC wastes. Two regimes of treatment were regarded: soft heating and thermal stroke. Pigments as filling agents were obtained on the basis of currently produced WMS wastes as well as of those taken from the tailing storage. The most intensive coloring – red and brown – was obtained as a result of waste treatment at the temperature of 1000º C. The important characteristics of pigments, used for production of colored silicate materials are their coloring capacity and degree of inertness related to raw mix, especially lime. The results obtained showed that coloring capacity of pigments as filling agents (defined by means of adding lime [1]) on the basis of WMC wastes form tailing storage is higher that that of currently produced wastes, which is connected with different iron oxides content. However in both cases this characteristic is not lower than 1, thus, the pigments as filling agents obtained can be used for volumetric coloring of silicate materials.

The activity of filling agents was estimated by absorption CaO from solutions by basic WMC wastes and WMS wastes that underwent thermal treatment. As a result of thermal treatment of LMC WMC wastes their sorption capacity changes in relation to Ca^{+2} ions: from 65 to 80 mg/g in the course of soft heating and up to 125 mg/g with the use of thermal stroke for currently produced wastes; from 69 to 71 mg/g in the course of soft heating and up to 97 mg/g with the use of thermal stroke from wastes taken from the tailing storage. Activation processes which take place when thermal stroke is used , as well as action of iron oxides as a mineralizing agent at high temperatures, according to the research references [2], result in higher defects of the structure of quartz content in WMC wastes and growing inner stresses which they create. It is how the growing sorption activity of pigment filling agents during thermal stroke can be explained. The characteristics obtained in both cases constitute over 55 mg/g, which according to classification [1], characterizes pigment filling agent made on WMC basis both currently produced and taken from the tailing storage, made by means of soft heating and thermal stroke, as highly active. The pigment filling agents obtained were used for volumetric coloring of silicate brick and were introduced into the raw mix (lime 10%, sand 90%) in the amount of 5 to 70% instead of silica component. After thermal treatment the coloring of brick samples becomes weaker compared to raw samples, light tints were obtained – depending on percentage of pigment content – from light pink to light terra-cotta. The use of pigments instead of quartz results in considerable increase of compressive strength compared to the control composition. Maximum values – 29,5 and 28,6 MPa are achieved if the sample contains 50% of currently produced MWC wastes and those from the tailing storage, which is 76 and 51% higher than in the control respectively. Strength increase according to RFA results is connected with the synthesis of extra number of new formations – hydroferrites and low basic calcium hydrosilicates. Quartz contained in WMC wastes is characterized by high reactive ability due to thermal activation in the burning process, which provides higher synthesis speed, mainly of low base calcium hydrosilicates of tobermorite type and hydroferrites in the course of reaction with iron oxides, contained in pigment filling agents.

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