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TO PROCESSING OF ALUMINIUM RAW MATERIAL FOR UKRAINE

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It is executed the analysis of aluminiumcontaoning raw material of Ukraine. The basic methods of processing for this raw material are considered and principal advantages and limitations of existent methods are described. There are shown prospects of the fluoride technology use for processing of aluminium raw material.

Key words: bauxites, nephelines, alunites, methods of processing

For creation in Ukraine of reliable source of raw materials of aluminium industry it is necessary effectively to use regional bad quality aluminiumcontaoning raw material: nephelitecontaoning rocks, low-grade bauxits, alunites, kaolins and clays.

The first by value type of raw material are nephelite ores. Them basic minerals are a nephelite and potassiumfilite. Considerable interest from nephelite raw material must also urites and syenites. Urites contain a 60-90 % nephelite, aegirine, and also aegirine-augite. Nephelite syenites consist of 10-30 % nephelite and 70-90 % alkaline feldspars.

Most essential are deposits of nephelite ores of the October array of Priazove, by a general volume about 2.9 milliards tons. From facts of average chemical analysis, ore contains, %: 55.4-53.2 SiO_2; 19.9-22.5 Al_2O_3; 10.0-12.0 R_2O (Na_2O+K_2O); 6.8-5.5 Fe_2O_3; 2.4-4.4 CaO. The nephelite rocks of the October array have considerable content of rare and rare-earth elements of such as a tantalum, niobium, zirconium and some other metals, that promotes its vailue and allows to examine such rocks as complex raw material for the receipt of rare metals [1-3].

The second by value type of aluminiumcontaoning raw material are alunites which has chemical composition, %: SO_3 - 38,66; Al_2O_3 - 36,92; H_2O - 13,05; K_2O - 11,37 [4]. In Zakarpattia there are considerable fields of alunite ores: Bigansk (290,3 million t.) and Berezivsk (51,4 million t.) [5]. Its defect is insignificant (about 30 %) content of alunite which results to the necessity of enriching.

Wide distribution for processing of bad quality aluminium raw material was got by the methods of sintering. Basis of sintering methods: formation of sodium aluminates during heating with a soda and fastening of dioxide silicon at it co-operating with a limestone in a twocalcic silicate.

Taking into account a presence in Ukraine nearby kaolins of large supplies of nephelite ores and limestones, the row of charts was investigated which foresee its the incorporated processing by the method of general sintering [6]. As one of variants kaolin concentrates of the Vladimirskiy field, which contain, %: 48,1 SiO_2; 35,8 Al_2O_3; 1,2 Fe_2O_3, burned out during two hours for temperatures 1100-1200 °C and lixiviated soda-alkaline solution which contains, g/dm^3: 110-120 Na_2O и 10-15 K_2O for temperatures 95-105 °C during one hour. In solution passed dioxide silicon, and in a remain got the enriched kaolin, %: 55-65 Al_2O_3; 24-34 SiO_2, which together with

a nephelite was added to sintering with a limestone and addition of soda solution for temperatures 1150-1250 °C. For the receipt of one ton of alumina there are spend 2.1 t. нефелінів, to the 2.1 t. kaolin and 6.8 t. limestone. During lixiviating the cakes drawing out of alumina folds 88-92 % and meadows – 87-90 %.

For processing of aluminium raw material with high content SiO_2 and small content Fe_2O_3 it is possible to use the acid methods of drawing out of alumina. Unlike alkaline methods at an acidization, SiO_2 to solution does not act practically, but Fe_2O_3 reacts in a considerable measure, which enables to separate considerable part of silica on the stage of lixiviating, but requires additional measures on cleaning of solutions from connections of iron and other metals.

It is possible to process the alunite ore a restoration-alkaline method [7]: the ground ore is added to the dehydrating burning in the furnaces of boiling layer for temperatures 500-520 °C with the next restoration burning in the noted furnaces for temperatures 560-580 °C. As a reducing material use elementary sulphur. Burning at such temperature allows to save activity of alumina and it ability to co-operate with alkaline solutions at atmospheric pressure.

To relation of new methods the productions of alumina, which allow to process bad quality raw material which contains aluminium, it is possible to take Ponomarev-Sazhin method and hydrogamet method [4,8].

Ponomarev-Sazhin method foresees fastening of silicate constituent of alu-nimiun raw material піж time of lixiviating in the sodium-alkaline hydrosilicate (SAHS). Exception of Na_2O from SAHS is carried out by treatment of $Ca(OH)_2$, by weak solutions of $NaOH$ or carbonation of pulp. To it defects is follows to take the necessity of the use of hyghconcentrated aggressive alkaline solutions, rapid selection of autoclave pulp and rigorisms to the reactionary apparatus.

Hydrogamet method [8] based on forming of hydrogamets iron during lixi-viating of aluminiumcontaining raw material. For this purpose it is necessary to provide in mash molar correlation of $3CaO : Fe_2O_3 = 3:1$, and correlation of $3CaO : SiO_2 = 1:2$. Lixiviating needs the use of circulating alkaline solutions from $\alpha_к > 15$. For lixiviating a from 200 to 400 g/dm^3 of Na_2O alkaline solutions a concen-tration for temperatures 240..300 ºC are applied. Lacks of method: necessity of use of large quantity of lime and use of high-modulus alkaline solutions.

Potential internal resources of aluminium raw material of Ukraine can not be cost-effective done with domestic enterprises by the method of sintering through considerable power charges [9]. Yet greater part of power charges is inherent for the variants of processing of nephelite raw material.

Considerable interest for processing of Ukraine silica-alumina ores is presented fluoride technology. Essence of method consists in primary co-operation of fluoride (NH_4F) or to the double fluoride ammonium (NH_4HF_2) with ore components. Already for temperatures 130-200 °C takes place co-operates for the double fluoride ammonium practically with all components which present a mountain rocks. As a result of co-operation can appear to the fluirinemetalates ammonium, hydrofluorides, or to take place to the reaction of фторування. Фторметалати and фториди which appear as a result of co-operation from NH_4HF_2 are different physical and chemical

characteristics, that allows to pick up the regimes of its distribution, and simplify the separation of SiO_2.

Used additional components (NH_4HF_2, NH_4OH) easily recommence in default of hard, liquid and gaseous wastes, that provides them reusing in the reserved technological processes and guarantees perfect ecological security of environment.

The researchs of fluoridation of kaolinite for Polozhi field (Zaporezhe region) was conducted with the receipt of nanocrystalline dioxine of silicon (white soot) and alumina in ZSIA [10,11]. It is shown that floirige technology will allow to get the prepared products with content a not less than 95 % useful component, subzero prime price and provides the complex zero-emission use of raw material.

Conclusions. In the case of the complex processing of bad quality aluminium raw material the fluoride method, which even can compete with drawing out of alumina from high-quality bauxite by Buer method is offered. The fluoride method can be use for drawing out of alumina from bad quality hygh silicic bauxits and from different silica-alumina rock and technogenic wastes, and also for processing of multimetallic ores.

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