UDC 669.712

V.N. Ochinsky, senior teacher
Yu.P. Nasekan, professor, c.t.s.

FEATURES OF ALUMINIUM ORE RAW MATERIAL FOR UKRAINE

Zaporizhzhya state engineering academy

The analysis of aluminium raw material of Ukraine is realized. It is shown that application of concentration provides possibility of production and processing of poor bauxite ores.

Key words: bauxites, nephelites, alunites, methods of concentration.

The mineral base of aluminium for Ukraine is deposits of bauxites, nephelite ores and alunites. Ukraine is poor by bauxites – there are educed only three deposits: Vysoko-pol'e, Nicopol and Cmelyansk. State balance of supplies of aluminium raw material takes into account only Vysokopol'e deposit of ferrous bauxites with boehmite-gibbsite-sha-moisite composition the supplies of which fold 18.9 million t [1].

The second by value type of aluminium raw material are nephelite ores (nephelite syenites). Them basic minerals are a nephelite of $Na_2O{\cdot}Al_2O_3{\cdot}2SiO_2$ and kaliophilite $K_2O{\cdot}\ Al_2O_3{\cdot}2SiO_2$, that are in isomorphic mixture with swinging majority of nephelite [2]. Most interest from nephelite raw material are presented urites and syenites. Urites contain to a 60-90 % nephelite, aegirine of $Na_2O{\cdot}Fe_2O_3{\cdot}4SiO_2$, and also aegirine-augite $mCaO\ (Mg,Fe)O{\cdot}2SiO_2{\cdot}n[Na_2O{\cdot}Fe_2O_3{\cdot}4SiO_2]$. Nephelite syenites consist from 10-30 % nephelite and 70-90 % alkaline feldspars $(Na,K)_2O{\cdot}Al_2O_3{\cdot}mSiO_2$, where $m > 2$.

In Ukraine most meaningful are alkaline complexes of the October array in Priazov'e, the supplies of nephelite ores of Mazyrevsk, Kalinin-Shevchnko and Vali-Taram deposits which fold about 2.9 milliards t. However processing of the noted ores needs considerable power charges and substantial modernization of technological process, that is why deposits while are not mastered. The feature of alkaline array for Donbas is a pre-sence of less-common metal nephelite ores, which contain a tantalum, niobium, zirconium and some other metals, what allows to examine them as complex raw material with the se of rare metals [3]. From data of chemical analysis, in the enriched ore contained, %: 20.0 Al_2O_3; 58.40 SiO_2; 14.70 R_2O (Na_2O+K_2O); 2.40 Fe_2O_3; 1.20 CaO; 0.90 MgO; 0.44 ZrO_2; 0.40 TiO_2; 0.08 Nb_2O. As a result the flotation enriching, output of tails which contain, %: 21.80 Al_2O_3; 52.80 SiO_2; 1.40 Fe_2O_3; 0.04 Nb_2O_5; 0.03 ZrO_2; 16.0 H_2O, folds 64.4 %.

Researches of the mechanical enriching of nephelite syenites with the purpose of se-lection to pyrochlorinezircon showed, that the output of concentrate folded 86 %, and content of basic components (initial ore is in brackets), %: 56.80 (57.70) SiO_2; 25.44 (22.56) Al_2O_3; 12.20 (7.94) Na_2O; 1.74 (2.53) K_2O; 1.61 (4.48) Fe_2O_3. Upgrading of got nephelite syenites was carried out by a way them chemical

enriching: it is fixed decline in the concentrate of content dioxide silicon to 40-41 % and increase of aluminium oxide - to 29.7-32.0 % [4].

In Ukraine as potential aluminum-bearing raw material can be examined the zakar-pattia alunite on condition of his complex use. By the state on 2006 p, on state balance there are two large deposits on Zakarpattia: Bigansk and Beregov deposites with the found out supplies of alunite ores accordingly – 290.3 and 51.4 million t, in addition, at the limits of Beregov ore field it is found almost ten alunite deposits and ores show, related with the secondary quartzites.

It is possible to obtain the alunite of ore by open method, but their defect is not high content of alunite (about 30 %) which results in the necessity of enriching of such ores. At work [5] there are studied possibility of the flotation enriching of general test of alunite ore of Bigansk deposit. The process of receipt for alunite concentrate was provided with content of alunite 51.5-55.0 % at his drawing out 91.7-88.8 %. In future on the basis of the got results the study of flotation of different types of alunite ores of this deposit was carried out. As a result of enriching, content of aluminium oxide in a con-centrate, depending on as ore, rises from 13.34-14.98 to 27.03-27.72 %.

Middle chemical composition of bauxites for Ukraine presents, %: 38 Al_2O_3; 9 SiO_2; 35 Fe_2O_3; 1 % CaO. Main rockforming mineral of aluminium raw material serves is gibbsite, together with him present is a boehmite. Such bauxites attribute to bad quality raw material, which for processing by Bayer method it is necessary to enrich.

For the separation of ferrous magnetic faction with success apply magnetic separation which includes the deep previous growing of bauxites (to $1 \cdot 10^{-5}$ m) together with drying or burning-out. As a result of magnetic ceparation of two tests of bauxite of Vu-sokopol'e deposits (gibbsite-boehmite composition) which contain, %: 39.3 and 45.7 Al_2O_3; 6.1 and 5.2 SiO_2; 28.6 and 22.9 Fe_2O_3, bauxite concentrates were got with content of 49.3 and 52.0 % Al_2O_3 and silica module which was evened 9.6 and 12.1 according. Most effective is application of magnetic separation for shamoisite-boehmite bauxites, where shamoisite which contains the oxide of iron (II) is the basic transmitter of dioxide silicon.

Magnetic separation with the previous burning is used for enriching of bauxites of hematite-boehmite type [6]. Three tests with the high (10 and more) silica module, which contain, %: 30.0-34.8 Al_2O_3; minerals of iron: dioxide iron – 26.3-39.1; shamoisite – 13.8-16.5; hematite – 10.4-30.9; goethite – 8.7-16.0 and other minerals are investigated. After the reducing burning and magnetic separation of bauxite content of aluminium oxide rose to 47.2-48.5 %. Drawing out of the noted oxide to the enriched product folded according to 62.5 and 75 %.

One of effective methods of moving away of dioxide silicon from bauxites there is flotation. Results, that it is got during enriching flotation of alunite ore for Beregov deposit of Zakarpattia, showed perspective of application as a collector of oxidized risacl (OP-100) in connection with the most exit of concentrate (43-44 %), content of alunite (51-56 %) and measure of his drawing (75-94 %) out from ore [7].

The chemical enriching as method of desiliconization raw material is studied for gibbsite-boehmite bauxites which contain a silica as a kaolinite. Burning of

bauxite at temperatures 925-1000 °C with the next lixiviating by solution of caustic soda for tem-perature 90 °C during three hours allows on 60-70 % to delete a silica with the loss of 3-4 % alumina in alkaline solution. During lixiviating of desilico-nizating such bauxite by the Bayer method in the interval of temperatures 220-245 °C takes place more complete drawing out of alumina (to 88 %), what from a primary bauxite.

Taking into account enhanceable content of iron in the bauxites of Vysokopol'e deposit, them it is expedient to add to the electrofusion on a ferrosilicon or cast-iron and aluminous slags of different composition, from which draw out an alumina. By such a way possible realization of the complex zero-emission processing of the noted type of raw material [8]. However such technology while can not effectively compete with processing of the high-quality imported bauxites on the plants of Ukraine from with high electricity charges.

Conclusions. Using of enriching to spread the ore base of aluminium raw material of Ukraine to the processes of enriching and processing of poor bauxite ores are become possible. A decision about the necessity of mining must accepted in economic acceptable limits on the basis of comparison of charges on enriching, also costs and internalss of raw material.

LIST OF LITERATURE

1. *Сапожников, Д. Г.* Бокситы Украины. Закономерности размещения бокситовых месторождений СССР [Текст] / Д. Г. Сапожников, А. П. Никитина. – М. : Наука, 1978. – 256 с. – Библиогр. : с. 254-255.
2. *Абрамов, В. Я.* Комплексная переработка нефелино-апатитового сырья [Текст] / В. Я. Абрамов, А. И. Алексеев, Х.А. Бадальянц. – М. : Металлургия, 1990. – 392 с. – Библиогр. : с. 382-392. – ISBN 5-229-00824-5.
3. Полупромышленные испытания флотационной схемы обогащения редкометалльных нефелиновых руд [Текст] / *Г. М. Шаповалов*, Ю. А. Быков, П. И. Андреев [и др.] // Обогащение полезных ископаемых : респ. межвед. науч.-техн. сб. – Киев : Техніка, 1968. – Вып. 3. – С. 83-88.
4. Современное состояние технологии обогащения алунитовых руд [Текст] / *Ю. А. Быков*, П. И. Андреев, Н. М. Анищенко, Т. В. Николаева // Цветная металлургия. – 1966. – № 1. – С. 3-9.
5. *Аграновский*, *А. А.* Алуниты - комплексное сырье алюминиевой промышленности [Текст] / А. А. Аграновский, Л. А. Ключанов, Г. З. Насыров. – М. : Металлургия, 1989. – 146 с. Библиогр. : с. 143-145. – ISBN 5-229-00317-0.
6. Обогащение низкосортных бокситов Украины [Текст] / *Л. М. Лютня*, П. И. Андреев, Ю. А. Быков [и др.] // Обогащение полезных ископаемых: респ. межвед научн.-техн. сб. – 1973. – Вып. 43. – С. 3-9.
7. Изучение вещественного состава и разработка технологии обогащения алунитовых руд Береговского месторождения Закарпатья [Текст] / *П. И. Андреев*, Ю. А Быков, Н. М. Анищенко [и др.] // Обогащение полезных ископаемых : респ. межвед. науч.-техн. сб. – Киев : Техніка, 1968. – Вып. 3. – С. 89-97.
8. Использование бокситов Высокопольского месторождения в производстве глинозема [Текст] / *М. И. Гасик*, Л. В. Венцковский, В. С. Игнатьев, С. Е. Сулименко // Состояние, проблемы и направления развития производства цветных металлов в Украине : сб. научн. тр. – Запорожье : РИО ЗГИА, 1997. – С. 36-37.