

Conclusions. Based on the results, obtained on the kinetics of the electric smelting of basalt from the Daubaba deposit, the following conclusions can be drawn:

- the extraction of Si, Al into the alloy and Ca into the calcium carbide becomes noticeable in the first 10 minutes of the process; in the absence of lime, the maximum degree of extraction of the silicon, aluminum in the alloy and the calcium, respectively, contain 80.8%, 72.2% and 69% in 45 minutes;

- the presence of 30% lime in the furnace-charge allows to increase the degree of calcium extraction into the calcium carbide up to 82.1%, however, at this time the extraction of the silicon and aluminum decreases;

- in the optimal technological area up to 6.1% of lime, for 46-50 minutes the extraction of the silicon and aluminum in the alloy is 77.1-86.8% and 75.0-82.08%, and α_{Ca} in the calcium carbide - 75-79%.

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REFERENCES

1 Abdullin I.Sh., Sharifullin F.S., Zhdankin D.Yu. *Modifikatsiya bazal'tovykh teploizolyatsionnykh materialov VCH plazmoy ponizhennogo davleniya* (Modification of basalt heat-insulating materials with high-pressure plasma of reduced pressure) // Vestnik Kazanskogo tekhnologicheskogo universiteta = Bulletin of Kazan Technological University. - 2014. - V. 17, N 14. - P. 147-149 (in Russ.).

2 Shevko V.M., Karatayeva G.E., Amanov D.D., Badikova A.D., Bitanova G.A. *Joint Production of Calcium Carbide and A Ferroalloy of The Daubaba Deposit Basalt*. International Journal of Mechanical Engineering and Technology (IJMET). - 2019. - V. 10, N 2. - P. 1187-1197 (in Eng.)

3 Shevko V., Karataeva G., Badikova A., Amanov D., Tuleev M. *Thermodynamic model of the influence of temperature and carbon on the production of ferroalloy and calcium carbide from the basalt of Dubersay deposit* // Kompleksnoe Ispol'zovanie Mineral'nogo syr'a. 306 (3), 2018, 86-94. <https://doi.org/10.31643/2018/6445.21> (in Eng.).

4 Tajmasov B.T., Zhanikulov N.N., Kaltaj A.R., Nurmaganbet N., Kosymbekova A. *Mineral'no-syr'evye istochniki dlja jenergosberegajushhego proizvodstva portlandcementnogo klinkera* (Mineral resource sources for energy-saving manufacturing of portland cement clinker). - N 2. - 2016. - P. 95-101/ (in Russ.).

5 Committee of Geology and Subsoil Use [electronic resource] – 2019. – URL: <http://info.geology.gov.kz/ru/informatsiya/spravochnik-mestorozhdenij-kazahstana/tverdye-poleznye-iskopaemye/item/даубабинское-3> (in Russ.).

6 Amanov D.D., Shevko V. M., Karatayeva G.E., Serzhanov G.M. *Thermodynamic analysis of obtaining ferroalloy from silicon-aluminum-containing silica clay* // Chemistry & Chemical Technology. - 2017. - V. 11, N 4. - P 411-414 (in Eng.).

7 Kozlov K.B., Lavrov B.A. *Poluchenie karbidakal'ciya v dugovoj pechi i ego analiz* (Preparation of calcium carbide in an arc furnace and its analysis). - St. Petersburg: St. Petersburg State Institute of Technology (Technical University). - 2011, 24 (in Russ.).

8 Bogdanov S.P., Kozlov, KB, Lavrov, B.A., Soloveinik, E.Ya. *Elektrotermicheskie processy i reaktory* (Electrothermal processes and reactors). - St. Petersburg: Science project. - 2009, 424 (in Russ.).

9 Akhnazarova S.A., Kafarov B.V. *Metody optimizatsii eksperimenta v himicheskoj promyshlennosti* (Experiment Optimization Methods in the Chemical Industry). - M.: High school. - 1978, 319 (in Russ.).

10 Ochkov V.F. *Mathcad 14 dlyastudentov, inzhenerov i konstruktorov* (Mathcad 14 for students, engineers and designers). St. Petersburg: BHV-Petersburg. - 2007, 368 (in Russ.).

ЛИТЕРАТУРА

1 Абдуллин И.Ш., Шарифуллин Ф.С., Жданкин Д.Ю. *Модификация базальтовых теплоизоляционных материалов ВЧ плазмой пониженного давления* // Вестник Казанского технологического университета. - 2014. - Т. 17, № 14. - С. 147-149.

2 Shevko V.M., Karatayeva G.E., Amanov D.D., Badikova A.D., Bitanova G.A. *Joint Production of Calcium Carbide and A Ferroalloy of The Daubaba Deposit Basalt*. International Journal of Mechanical Engineering and Technology (IJMET). - 2019. - V. 10, N 2. - P. 1187-1197.

3 Шевко В. М., Каратаева Г. Е., Бадикова А. Д., Аманов Д. Д., Тулеев М. А. *Термодинамическая модель влияния температуры и углерода на получение ферросплава и карбида кальция из базальта месторождения Дуберсай* // Комплексное использование минерального сырья. - №3.-2018. -С. 86-94

4 Таймасов Б.Т., Жаникулов Н.Н., Калтай А.Р., Нурмаганбет Н., Косымбекова А. *Минерально-сырьевые источники для энергосберегающего производства портландцементного клинкера* // Комплексное использование минерального сырья. - №2.-2016. -С. 95-101

5 Комитет геологии и недропользования [электронный ресурс] – URL: <http://info.geology.gov.kz/ru/informatsiya/spravochnik-mestorozhdenij-kazahstana/tverdye-poleznye-iskopaemye/item/даубабинское-3>

- 6 Amanov D.D., Shevko V. M., Karatayeva G.E., Serzhanov G.M. *Thermodynamic analysis of obtaining ferroalloy from silicon-aluminum-containing silica clay* // Chemistry & Chemical Technology. - 2017. - V. 11, N 4. - P 411-414.
- 7 Козлов К.Б., Лавров Б.А. *Получение карбида кальция в дуговой печи и его анализ*. - Санкт-Петербург: Санкт-Петербургский технологический институт (технический университет). - 2011, 24.
- 8 Богданов С.П., Козлов К.Б., Лавров Б.А., Соловейник Э.Я. *Электротермические процессы и реакторы* - Санкт-Петербург: Проект науки. - 2009, 424.
- 9 Ахназарова С.А., Кафаров Б.В. *Методы оптимизации эксперимента в химической промышленности*. - М.: Высшая школа. -1978, 319.
- 10 Очков В.Ф. *Mathcad 14 для студентов, инженеров и конструкторов*. Санкт-Петербург: БХВ-Петербург. - 2007, 368.

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