

Analysis of Opportunities for Recycling Carbon-containing Waste of Aluminium Production

L.Ya. Shubov¹, FSAI Environmental Industrial Policy Center (FSAI EIPC), Prof. Dr. (Sc.), l.shubov@eipc.center

M.V. Dobrokhotova², FSAI EIPC

I.G. Doronkina³, FSAI EIPC, PhD (Sc.), doronkinaig@mail.ru

M.R. Anisimova⁴, FSAI EIPC

¹ Senior Researcher, Moscow, Russia

² Deputy Director, Moscow, Russia

³ Researcher, Moscow, Russia

⁴ Head of Industrial Ecology Department, Moscow, Russia

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In the given article, we have assessed the opportunities for recycling and utilising of carbon-containing waste of aluminium production (containing 20–85 % of carbon). We have demonstrated such options as extraction of valuable components (including carbon as a fuel); application as sorbents and reductants and additives in the production of cement. Several advantages of the analysed solutions have been emphasised. It is the enhancement of the main production process efficiency and its environmental performance, reduction of waste management and disposal costs, exclusion of irrevocable losses of carbon and fluorine-containing products. We have underlined the prospects for considering patented technologies for review of reference documents on Best Available Techniques.

References

1. Skobelev D.O. Promyshlennaya politika povysheniya resursoeffektivnosti kak instrument dostizheniya tseley ustoychivogo razvitiya [Industrial policy of increasing resource efficiency as a tool for achieving the Sustainable Development Goals], *Journal of New Economy*, 2020, no. 4, pp. 153–173. DOI: 10.29141/2658-5081-2020-21-4-8.
2. Skobelev D.O. Vozvrashchenie vtorichnykh resursov v khozyaystvennyy oborot: ekonomicheskie, tekhnologicheskie i pravovye aspekty [Return of secondary resources to economic circulation: economic, technological and legal aspects], *Kompetentnost' / Competency (Russia)*, 2020, no. 4, pp. 8–15. DOI: 10.24411/1993-8780-2020-10402.
3. Moiseenko T.I. Evolyutsiya biogeokhimicheskikh tsiklov v sovremennykh usloviyakh antropogennykh nagruzok: predely vozdeystviy [Evolution of biogeochemical cycles in modern conditions of anthropogenic loads: limits of impacts], *Geokhimiya*, 2017, no. 10, pp. 841–862.
4. Begak M.V., Guseva T.V. Problemy provedeniya ekologicheskoy reformy v Rossii [Problems of environmental reform in Russia], *Vodnoe khozyaystvo Rossii: problemy, tekhnologii, upravlenie*, 2015, no. 5, pp. 70–78.
5. Shubov L.Ya., Skobelev K.D., Doronkina I.G. Kriterii resurso- i energoeffektivnosti pri pererabotke tekhnogennogo syr'ya i otsenka ego kachestva (na primere gorno-metallurgicheskoy otrasli) [Criteria of resource and energy efficiency in the processing of man-made raw materials and assessment of its quality (on the example of the mining and metallurgical industry)], *Ekologiya promyshlennogo proizvodstva*, 2020, no. 4(112), pp. 15–22.
6. Information and technical guide to the Best Available Techniques ITG 11–2019 Aluminium production.
7. Patent RF N 2609478 S22V7. Sposob pererabotki otrabotannoy futerovki alyuminievogo elektrolizera [Method for processing the spent lining of an aluminium electrolyzer], Patent Rossii N 2609478 S22V7, Ivanov N.A., Rzhchitskiy E.P., Shakhray S.G., Kondrat'ev V.V.
8. Patent RF N 2419661 S22V7, 27.05.2011. Sposob pererabotki otkhodov alyuminievogo proizvodstva (khvostov flotatsii ugol'noy peny i shlama gazoochistki) [Method for processing aluminium production waste (coal foam flotation tailings and gas treatment sludge)], Patent Rossii N 2419661 S22V7, 2010, Nozhko S.I., Gavrilenko L.V., Baranov A.N., Kamenskiy A.O.
9. Patent RF N 2497958 S22V7, 10.11.2013. Sposob polucheniya briketov iz ftoru glerodsoderzhashchikh otkhodov [Method for producing briquettes from fluorocarbon-containing waste], Patent Rossii N 2497958 S22V7, 2012, Filippov S.V., Baranov A.N., Volynskiy V.V., Gavrilenko L.V., Anikin V.V.
10. Patent RF N 2472865 S22V7, S22V21, 20.01.2013. Sposob pererabotki ftorsoderzhashchikh otkhodov elektroliticheskogo proizvodstva alyuminiya [Method for processing fluorine-containing waste from the electrolytic production of aluminium], Patent Rossii N 2472865 S22V7, S22V21, 2011, Kondrat'ev V.V., Rzhchitskiy E.P., Rzhchitskaya A.I., Ivanov N.A.
11. Patent RF N 2417162 S01F7, 27.04.2011. Sposob pererabotki shchelochnogo alyumosilikatnogo syr'ya [Method of processing of alkaline aluminosilicate raw materials], Patent Rossii № 2417162 S01F7, 2009, Medvedev G.P., Dashkevich R.Ya., Pivnev A.I.
12. Patent RF N 2404271 S22V, 20.11.2010. Sposob pererabotki nekonditsionnykh zhelezo- i tsinksoderzhashchikh otkhodov metallurgicheskogo proizvodstva [Method for processing substandard iron and zinc-containing waste from metallurgical production], Patent Rossii N 2404271 S22V, 2009, Ul'yanov V.P., D'yachenko V.F., Artamonov A.P., Gibadulin M.F., Ul'yanova I.V., Smirnov A.S.