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On the issue of processing and utilization of waste from the enrichment of lead-zinc ores as secondary raw materials

The mining and metallurgical industry is the leading sector of the Kazakh economy, accounting for 15.2% of the total industrial production. Many mining and metallurgical industries are city-forming, and therefore the development of the mining and metallurgical complex (hereinafter - MMC) is the development of cities, jobs for more than 200 thousand people, as well as the accumulation of a huge amount of waste from enrichment [1]. In the CIS, the total volume of mined mining and solid minerals is about 3.5 billion m^3 per year, and taking into account mining and preparation and processing works - about 5 billion m^3, i.e. 1.5 billion m^3 of rock is mined along the way (the bulk of which, after enrichment, is stored in dumps and tailings) to ensure the extraction of basic minerals from the ground.

In the message of the First President of the Republic of Kazakhstan - Leader of the Nation, N.A. Nazarbayev to the people of Kazakhstan dated January 10, 2018 "New opportunities for development in the context of the fourth industrial revolution" it is noted that the modern world, as before, continues to need resources, which in the future will have a separate place in the development of the world global economy and the economy of our country. However, at the same time, it is necessary to critically rethink the organization of the raw material industries, namely, to revise the approaches to the management of natural resources. It is necessary to actively introduce integrated information technology platforms for natural and man-made raw materials. And significantly increase the requirements for energy efficiency and resource conservation of industrial enterprises of the chemical, energy, mining and metallurgical industries, as well as their environmental friendliness and efficiency [2,3].

At present, due to the decrease in valuable metals in ores and the increasing amount of refractory raw materials [4, 5], it is economically expedient and necessary

to comprehensively process both poor, substandard and hard-to-reach mineral raw materials, as well as technogenic ones, in particular, those found in dumps tails of countries such as Kazakhstan, Uzbekistan, Russia, Finland, Poland, Ukraine, Canada and Argentina.

It is known that the main resources in the production of binders were previously provided by traditional mineral raw materials. In the new economic realities, this approach is changing qualitatively, and industrial waste acts as a secondary raw material [1, 6]. The cost of such raw materials is much lower, and the processing conditions are often simple. These features of economic development insistently require a qualitative study of all types of accumulated and unused waste. One of such wastes is waste from the mining and processing and metallurgical industries - tailings from the enrichment of the Kentau concentration plant (Figure 1) stored in a tailing dump near the Bayaldyr settlement (Figure 2) in the Turkestan region of Kazakhstan [7,8]. The Bayaldyr tailing dump is a complex of special structures and equipment designed for storage of waste dumps of lead-zinc ore dressing, called tailings. At the Kentau enrichment plant (KEP), concentrate was obtained from the mined ore, and the processing wastes were transferred to the tailing dump. At the moment, according to various sources, about 150 million tons of enrichment wastes have been stored there [9-13]. At the same time, the tailing dump occupies a significant area of land in the southwestern part of the Kentau region and amounts to about 333.0-350.0 hectares.

Figure1- Photo of the former Kentau enrichment plant

Figure 2- Photo of the tailing dump of waste from the enrichment of lead-zinc ores, near the village of Bayaldyr, Turkestan region

According to the research of a number of scientists, it has been established that the wastes from the enrichment located in the tailing dump have the following chemical elemental-mineralogical composition, mass. [9-11,13]: Pb- 1,88%; $Fe_{общ}$ - 7,13%; FeS_2-11,2%, MgO-1,6%; CaO-10,88%; Al_2O_3-11,81%; SiO_2-54,75%; $PbSO_4$-0,32%; $PbCO_3$-0,52%;, PbS-0,95%; $ZnCO_3$-0,73%; $ZnSiO_3$-0,33%; ZnS-3,84%; ppp - the rest. From the given chemical composition of the tailings, it can be seen that they contain in their chemical composition a number of useful compounds, in particular, oxides of silicon, aluminum and iron, which can be used to obtain cement clinker, as well as residual compounds of lead and zinc, which are from the point of view of ecology and life safety with heavy non-ferrous metals, which have a negative anthropogenic impact on the environment [1, 9-13], but at the same time, they are one of the valuable non-ferrous metals for the metallurgical industry [14-17].

Unfortunately, in contrast to foreign countries with developed economies, at factories in the CIS countries, the practice of processing waste tailings has not found the proper distribution, despite the presence of a huge amount. Thus, research and scientific work aimed at reducing energy costs and unit costs of raw materials, involving man-made raw materials in the production cycle as secondary ones, while reducing the harmful impact on the environment through waste disposal, are relevant, new and require a comprehensive quality approach for their further development and implementation in production.

References

1. Чантурия В.А., Вигдергауз В.Е., Шрадер Э.А. и др. Прогрессивные (экологически значимые) технологии переработки медно-цинкового минерального сырья техногенных месторождений: проблемы и решения //Инж. экология. 2004. № 5. С. 3-11.

2. Послание Президента Республики Казахстан Н. Назарбаева народу Казахстана. Новые возможности развития в условиях четвертой промышленной революции. Астана. 10 января 2018 г.

3. Закон Республики Казахстан от 13 января 2012 года № 541-IV «Об энергосбережении и повышении энергоэффективности» (с изменениями и дополнениями по состоянию на 15.01.2019 г.)

4. Резниченко В.А, Липихина М.С., Морозов А.А и др. Комплексное использование руд и концентратов. - М.: Наука, 1989. -72с.

5. Алшанов Р.А. Казахстан на мировом минерально-сырьевом рынке: Проблемы и их решение. - Алматы, 2004. -220с.

6. Евдокимов С.И., Евдокимов В.С. Ликвидация накопленного экологического ущерба путем утилизации лежалых хвостов свинцово-цинковой обогатительной фабрики // Экология и промышленность. 2014. С. 813.

7. Джаналеева К.М. Антропогенное ландшафтоведение. - Алматы: Казак университеті, 2001. - 163 с.

8. Чигаркин А.В. Региональная геоэкология Казахстана. Алматы.: Казак университеты, 2000. - 224 с.

9. Канаев А.Т., Есиркепова Ж.Д., Канаева З.К., Аманбаева У. Формирование растительности в условиях хвостов отвалов обоготительной фабрики и тепловых электростанций южного региона Казахстана // Международный журнал прикладных и фундаментальных исследований. – 2016. – № 3-4. – С. 615-619.

10. Исаева А.У., Ешибаев А.А. Проблемы сохранения биоразнообразия растений на юге Казахстана //Сб. науч. тр. «В мире научных открытий» II Международной и Всероссийской научной конференции «Научное творчество XXI века». – Красноярск, 2010. – № 4(10), Часть 17. – С. 17–20.

11. Бекебаева М.О., Канаев А.Т. Влияние антропогенных факторов на состав и структуру растительных сообществ // «Вестник современных исследований». Выпуск № 2-12 (29). С. 7-13.

12. Айриянц А. А., Бортникова С. Б. Хранилище сульфидсодержащих отходов обогащения как источник тяжелых металлов (Zn, Pb, Cu, Cd) в окружающей среде // Химия в интересах устойчивого развития. - 2000. - Т. 8. - С. 315-326.

13. Абдраимова К.Т., Ерденов М.Т. Культурфитоценозы свинцово-цинковых руд баялдырского хвостохранилища // В мире научных открытий. 2010. № 4-4 (10). С. 121-123.

14. Арбатов А.А., Астахов А.С., Лавров И.П. и др. Нетрадиционные ресурсы минерального сырья. М., Недра, 1988, 253 с.

15. Патент № 2197547. Республика Казахстан, МПК 7, C22B7/00, B03B7/00. Комбинированный способ переработки хвостов обогащения полиметаллических руд / Сычева Е. А., Акылбеков А., Ушаков Н. Н., Кушакова Л. Б.; заявитель и патентообладатель Восточный научно-исследовательский горно-металлургический институт цветных металлов, - опубл. Бюл.№ 3от 27.01.2003.

16. Ayeni F.A., Lbitoye S.A., Adeleke A.A. Evaluation of a magnetic-gravity processing route to recover columbity from Jos Minesfield tailings dump, Nigeria // J. Mining Metall. Sect. A: Mining. 2012. Vol. 48 A. P. 143-151.

17. Chen Y., Mariba E.R., Van Dyk L., Potgieter J.H. A review of non-conventional metals extracting technologies from ore and waste // Int. J. Miner. Process. 2011. Vol. 1. P. 1-7.