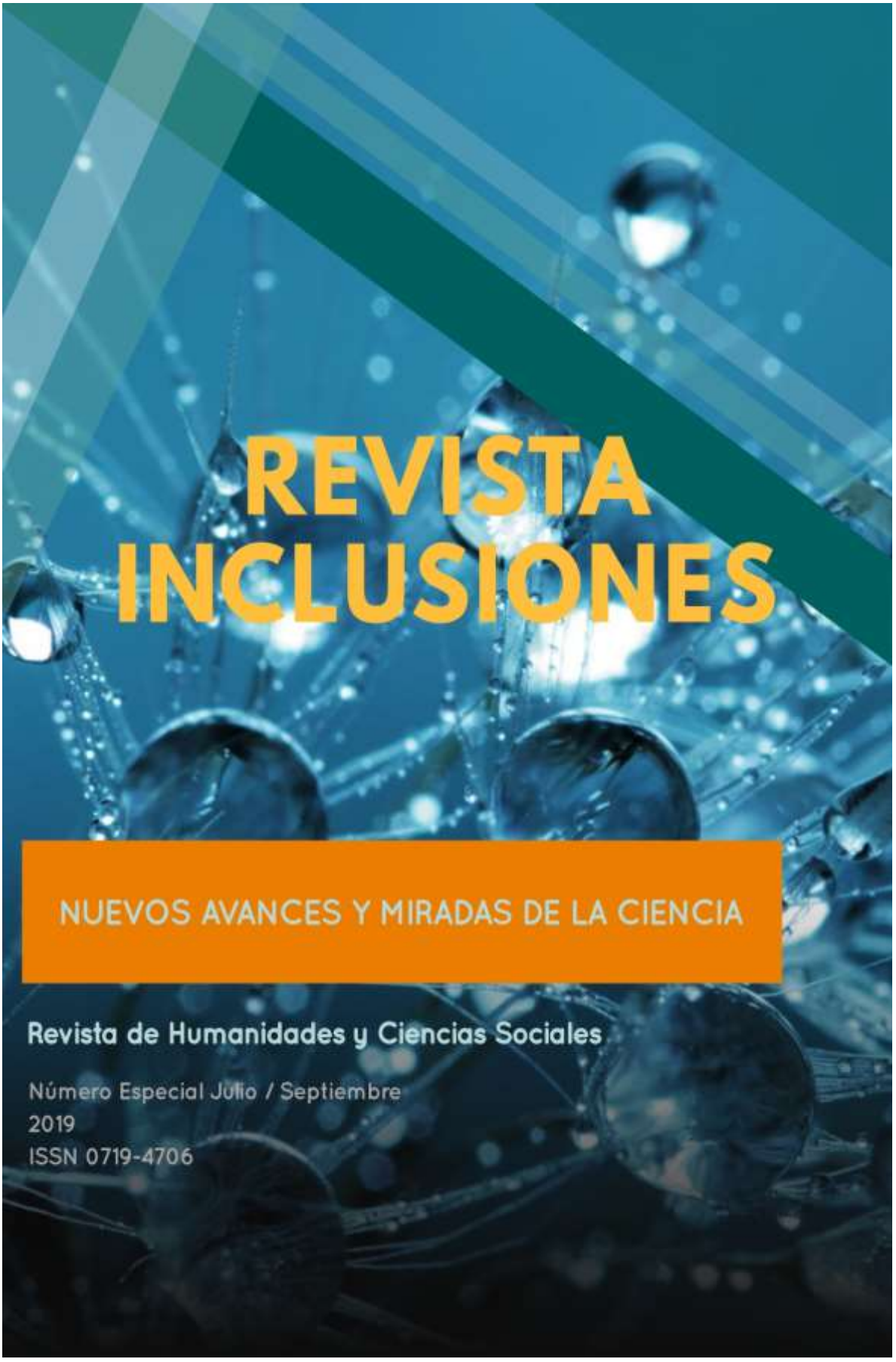
REVISTA
INCLUSIONES
NUEVOS AVANCES Y MIRADAS DE LA CIENCIA
Revista de Humanidades y Ciencias Sociales
Número Especial Julio / Septiembre
2019
ISSN 0719-4706

REVISTA INCLUSIONES
REVISTA DE HUMANIDADES Y CIENCIAS SOCIALES

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REVISTA DE HUMANIDADES Y CIENCIAS SOCIALES

CUADERNOS DE SOFÍA EDITORIAL

ISSN 0719-4706 - Volumen 6 / Número Especial / Julio – Septiembre 2019 pp. 30-34

ECONOMIC ASPECTS OF CONVERGENCE OF TECHNOLOGIES OF EXTRACTION OF METALS FROM THE DEADENED RESOURCES

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Fecha de Recepción: 09 de marzo de 2019 – **Fecha Revisión**: 23 de abril de 2019

Fecha de Aceptación: 13 de junio de 2019 – **Fecha de Publicación**: 01 de julio de 2019

Abstract

The revival of the Russian economy of the post-reform period provides the deep transformation of production of goods assuming activation of development of breakthrough technologies on the importance. Development of new such technologies in the conditions of a new type of production of goods assumes the solution of a problem of convergence of technologies which can be realized in packages of territorial industrial clusters of integration of production and other organizations within the uniform territory. Manufacturing enterprises, joint in a cluster, can hold a steady position in the conditions of volatile market conditions due to flexible cluster structure, synergetic effect, and other advantages. Hundreds of billion tons firm wastes which can be raw materials for production of products at the extraction of metals from them are stored in storages of tails of mining and metallurgical production. Results of theoretical and experimental justification of an opportunity and expediency of utilization of tails of processing of metal ores after extraction from them the remained metals on mechanochemical technology are presented.

Keywords

Economy – Technologies – Convergence – Industrial cluster – Volatility

Para Citar este Artículo:

Khasheva, Zarema M.; Golik, Vladimir I.; Kravchenko, Nikolay P.; Milovanov, Vladislav F. y Adamyan, Zhanna A. Economic aspects of convergence of technologies of extraction of metals from the deadened resources. Revista Inclusiones Vol: 6 num Esp Jul-Sep (2019): 30-34.

In the economy of the post-reform period of Russia it is possible to allocate the stages which had a priority in the time interval:

- evaluation of the mechanism of a transitional economy;
- a search of ways of development in the conditions of globalization;
- value of accounting of volatility and economic tension in the conditions of change of technological ways.

One of the newest directions of development of the economy is receiving profit on the realization of waste of processing of mineral resources. In recent years the economy of the developed countries developed, thanks to progress in science and technicians. The emergence of highly effective explosives and the boring equipment repeatedly strengthened possibilities of extraction from a subsoil of minerals to what there was unprepared an overworking technology. This discrepancy led to education to necrosis of a part of the extracted raw materials - the tails of processing having the actual cost of metals and other valuable components. In the world, no more than 10% of the volume of the extracted mineral raw materials are used, and the others are lost.

Economic and demographic changes in human community stimulate to look for new raw sources of receiving products, including utilization of the saved-up production wastes which are stored, threatening the environment in regions of production[1]. Their most part can be raw materials for production of materials, but interferes with it, for example, the content of the metals which are not extracted when processing.

The revival of the Russian economy provides not just the solution of problems of reindustrialization and profound transformation of industrial production with complex activation by the development of breakthrough technologies. Realization of this task is assumed by the solution of a problem of convergence of technologies. Practice shows that the consensus of methods of mechanical enrichment of metallic raw materials becomes the instrument of convergence. Example of the economically motivated symbiosis of technologies is a combination of one technological process of two types of energy: mechanical and chemical (fig. 1).

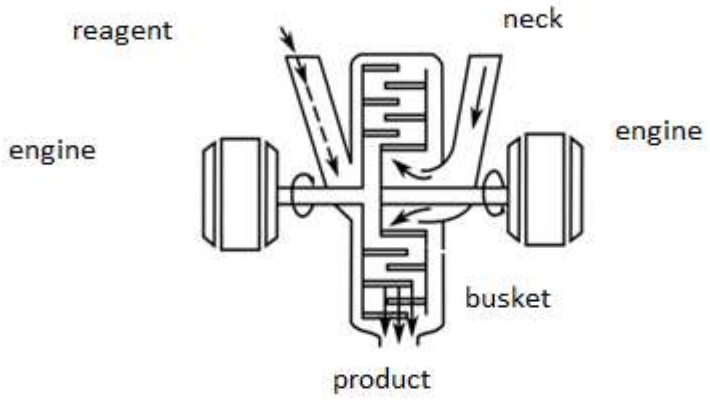

Fig. 1
The scheme of leaching of tails of enrichment in a disintegrator

[1] D. Stefanescu and I. Foidas, Recovery factor and replacement ratio of reserves, key parameters of monitoring the natural gas process. Proceedings of the 17th International Multidisciplinary Scientific GeoConference SGEM 2017. STES92 Technology Ltd. 2017.

Prospects of a combination of opportunities of chemical enrichment in disintegrators for basic options with leaching options: infiltration, propaganda and new options of leaching in a disintegrator, it is proved by assessment of options by the criterion of extraction of metals[2].

Equal extraction of metals in solution is provided in a disintegrator in time, on 2 orders smaller, than at basic propaganda leaching. Results of the pilot studies executed in this direction allow claiming[3] that mechanical activation of the process of leaching in a disintegrator increases extraction from tails in comparison with a basic option of leaching by 1,2 - 1,5 times by 2 orders of time quicker. The main property of disintegrative technology consists of the creation of the active working planes and easing inside - and intermolecular communications in a particle at a high speed of processing of minerals. Properties of materials change during physical and chemical processes of division and concoction of components of minerals. Extraction of metals in solution happens along with the destruction of crystals, and the lixiviating solution is pressed in the cracks which are formed from deformation of particles. A condition of realization of technology is an opportunity creation in mineral electrically of the nonequilibrium weakened centers within which leaching processes develop.

For example, now only in tailings dams of KMA about 1.8 billion tons of waste of enrichment with an annual increase by 60 million tons are stored. Processing in a disintegrator together with extraction of metals increases the knitting abilities of the concrete (tab. 1) made on the basis of tails.

Components of a mix, kg/m^3				Durability and coefficient of a variation		
				Age, days.		
cement	astringent	inert	water	14	28	90
Activation in a spherical mill (a subtlety of 40%)						
40	400	1200	350	0,33	0,40	0,60
80	360	1200	350	0,42	0,60	0,70
120	320	1200	350	0,81	1,00	1,22
180	260	1200	350	1,07	1,25	1,59
Activation in a disintegrator (a subtlety of 40%)						
40	400	1200	350	0,61	0,92	1,18
80	370	1200	350	0,90	1,20	1,40
120	320	1200	350	1,20	1,42	1,68
180	260	1200	350	1,64	1,72	2,10

Table 1
Mix durability on the basis of tails after activation

[2] V. Golik; V. Komashchenko and V. Morkun, “Innovative technologies of metal extraction from the ore processing mill tailings and their integrated use”, Metallurgical and Mining Industry nun 3 (2015): 49-52 y V. V. Babkin and D. D. Uspensky, New strategy. Chemistry-2030. Advanced processing of raw materials. Clustering. Chemical fixation of the industry of the Russian Federation. Moscú: Face. 2015.

[3] V. I. Golik; Y. I. Razorenov and O. N. Polukhin, “Metal extraction from ore beneficiation codas by means of lixiviation in a disintegrator”, International Journal of Applied Engineering Research num 17 (2015): 38105-38109.

Change of properties of initial materials allows to create the uniform system of resource-saving and to turn proceeds on hardening of a financial position (fig. 2).

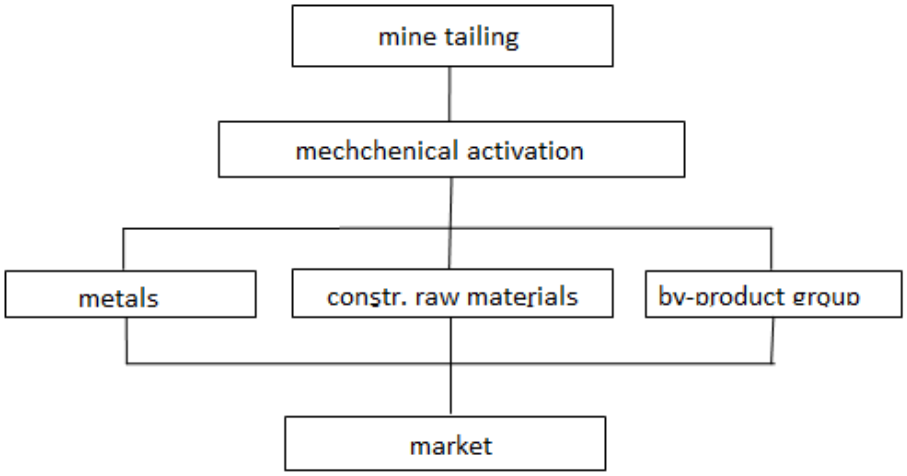

Fig. 2
The scheme of receiving new materials on the basis of enrichment tails

Processing of tails of enrichment enters earlier deadened products into the market: industrial products, concentrates, quartz sand for the construction industry and low-temperature stone casting, for production of products from glass, silt fraction and many others[4].

The efficiency of utilization of tails of enrichment consists of a decrease in size of damage from the storage of tails, the cost of the metals and nonmetals received when processing, raw materials for the construction industry and passing products. The economic importance of a phenomenon of leaching of metals consists of ores in transformation unsuitable for use and dangerous substances in raw materials for the production of goods with actual consumer cost. Results of the research are confirmed by the considerable volume of pilot studies in the direction of utilization of tails of enrichment of metal ores and coals[5].

Realization of economically expedient technologies stimulates the formation of industrial clusters. Their formation promotes the integration of production and other organizations within regions or their group for an increase in the economy. It is especially important because manufacturing enterprises and other organizations, joint in a cluster, are steadier in the conditions of volatile market conditions due to the flexibility of the structure, synergetic effect, economy on transactional costs, effective exchange of knowledge and information and other economic factors.

[4] V. I. Golik; Yu. I. Razorenov and S. A. Maslennikov, Protection of the natural geological environment utilization of tails of enrichment of ores. News of Tomsk Polytechnic University. Engineering of the georesources. 2015 y V. I. Komashchenko, Ecology-economic feasibility of utilization of mining waste for the purpose of their processing. News of the Tula state university. Sciences about Earth. 2015.

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Conclusions

Waste of processing of the extracted ores of metals contain elements which can be raw materials for new technologies of industrial production. Leaching of metals allows producing the new commodity materials having value added. The integration of innovative technologies is the instrument of realization of the breakthrough directions of the economy of the post-reform period of Russia.

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