



REVISTA INCLUSIONES

NUEVOS AVANCES Y MIRADAS DE LA CIENCIA

Revista de Humanidades y Ciencias Sociales

Número Especial Julio / Septiembre

2019

ISSN 0719-4706

CUERPO DIRECTIVO

Directores

Dr. Juan Guillermo Mansilla Sepúlveda

Universidad Católica de Temuco, Chile

Dr. Francisco Ganga Contreras

Universidad de Los Lagos, Chile

Subdirectores

Mg. Carolina Cabezas Cáceres

Universidad de Las Américas, Chile

Dr. Andrea Mutolo

Universidad Autónoma de la Ciudad de México, México

Editor

Drdo. Juan Guillermo Estay Sepúlveda

Editorial Cuadernos de Sofía, Chile

Editor Científico

Dr. Luiz Alberto David Araujo

Pontificia Universidade Católica de Sao Paulo, Brasil

Editor Brasil

Drdo. Maicon Herverton Lino Ferreira da Silva

Universidade da Pernambuco, Brasil

Editor Europa del Este

Dr. Alekzandar Ivanov Katrandhiev

Universidad Suroeste "Neofit Rilski", Bulgaria

Cuerpo Asistente

Traductora: Inglés

Lic. Pauline Corthorn Escudero

Editorial Cuadernos de Sofía, Chile

Traductora: Portugués

Lic. Elaine Cristina Pereira Menegón

Editorial Cuadernos de Sofía, Chile

Portada

Sr. Felipe Maximiliano Estay Guerrero

Editorial Cuadernos de Sofía, Chile

COMITÉ EDITORIAL

Dra. Carolina Aroca Toloza

Universidad de Chile, Chile

Dr. Jaime Bassa Mercado

Universidad de Valparaíso, Chile

Dra. Heloísa Bellotto

Universidad de Sao Paulo, Brasil

Dra. Nidia Burgos

Universidad Nacional del Sur, Argentina

Mg. María Eugenia Campos

Universidad Nacional Autónoma de México, México

Dr. Francisco José Francisco Carrera

Universidad de Valladolid, España

Mg. Keri González

Universidad Autónoma de la Ciudad de México, México

Dr. Pablo Guadarrama González

Universidad Central de Las Villas, Cuba

Mg. Amelia Herrera Lavanchy

Universidad de La Serena, Chile

Mg. Cecilia Jofré Muñoz

Universidad San Sebastián, Chile

Mg. Mario Lagomarsino Montoya

Universidad Adventista de Chile, Chile

Dr. Claudio Llanos Reyes

Pontificia Universidad Católica de Valparaíso, Chile

Dr. Werner Mackenbach

Universidad de Potsdam, Alemania

Universidad de Costa Rica, Costa Rica

Mg. Rocío del Pilar Martínez Marín

Universidad de Santander, Colombia

Ph. D. Natalia Milanesio

Universidad de Houston, Estados Unidos

Dra. Patricia Virginia Moggia Münchmeyer

Pontificia Universidad Católica de Valparaíso, Chile

Ph. D. Maritza Montero

Universidad Central de Venezuela, Venezuela

Dra. Eleonora Pencheva

Universidad Suroeste Neofit Rilski, Bulgaria

Dra. Rosa María Regueiro Ferreira

Universidad de La Coruña, España

Mg. David Ruete Zúñiga

Universidad Nacional Andrés Bello, Chile

Dr. Andrés Saavedra Barahona

Universidad San Clemente de Ojrid de Sofía, Bulgaria

Dr. Efraín Sánchez Cabra
Academia Colombiana de Historia, Colombia

Dra. Mirka Seitz
Universidad del Salvador, Argentina

Ph. D. Stefan Todorov Kapralov
South West University, Bulgaria

COMITÉ CIENTÍFICO INTERNACIONAL

Comité Científico Internacional de Honor

Dr. Adolfo A. Abadía
Universidad ICESI, Colombia

Dr. Carlos Antonio Aguirre Rojas
Universidad Nacional Autónoma de México, México

Dr. Martino Contu
Universidad de Sassari, Italia

Dr. Luiz Alberto David Araujo
Pontificia Universidad Católica de Sao Paulo, Brasil

Dra. Patricia Brogna
Universidad Nacional Autónoma de México, México

Dr. Horacio Capel Sáez
Universidad de Barcelona, España

Dr. Javier Carreón Guillén
Universidad Nacional Autónoma de México, México

Dr. Lancelot Cowie
Universidad West Indies, Trinidad y Tobago

Dra. Isabel Cruz Ovalle de Amenabar
Universidad de Los Andes, Chile

Dr. Rodolfo Cruz Vadillo
Universidad Popular Autónoma del Estado de Puebla, México

Dr. Adolfo Omar Cueto
Universidad Nacional de Cuyo, Argentina

Dr. Miguel Ángel de Marco
Universidad de Buenos Aires, Argentina

Dra. Emma de Ramón Acevedo
Universidad de Chile, Chile

Dr. Gerardo Echeita Sarrionandia
Universidad Autónoma de Madrid, España

Dr. Antonio Hermosa Andújar
Universidad de Sevilla, España

Dra. Patricia Galeana
Universidad Nacional Autónoma de México, México

Dra. Manuela Garau
Centro Studi Sea, Italia

Dr. Carlo Ginzburg Ginzburg
Scuola Normale Superiore de Pisa, Italia
Universidad de California Los Ángeles, Estados Unidos

Dr. Francisco Luis Girardo Gutiérrez
Instituto Tecnológico Metropolitano, Colombia

José Manuel González Freire
Universidad de Colima, México

Dra. Antonia Heredia Herrera
Universidad Internacional de Andalucía, España

Dr. Eduardo Gomes Onofre
Universidade Estadual da Paraíba, Brasil

Dr. Miguel León-Portilla
Universidad Nacional Autónoma de México, México

Dr. Miguel Ángel Mateo Saura
Instituto de Estudios Albacetenses "Don Juan Manuel", España

Dr. Carlos Tulio da Silva Medeiros
Diálogos em MERCOSUR, Brasil

+ Dr. Álvaro Márquez-Fernández
Universidad del Zulia, Venezuela

Dr. Oscar Ortega Arango
Universidad Autónoma de Yucatán, México

Dr. Antonio-Carlos Pereira Menaut
Universidad Santiago de Compostela, España

Dr. José Sergio Puig Espinosa
Dilemas Contemporáneos, México

Dra. Francesca Randazzo
Universidad Nacional Autónoma de Honduras, Honduras

Dra. Yolando Ricardo

Universidad de La Habana, Cuba

Dr. Manuel Alves da Rocha

Universidade Católica de Angola Angola

Mg. Arnaldo Rodríguez Espinoza

Universidad Estatal a Distancia, Costa Rica

Dr. Miguel Rojas Mix

*Coordinador la Cumbre de Rectores Universidades
Estatales América Latina y el Caribe*

Dr. Luis Alberto Romero

CONICET / Universidad de Buenos Aires, Argentina

Dra. Maura de la Caridad Salabarría Roig

Dilemas Contemporáneos, México

Dr. Adalberto Santana Hernández

Universidad Nacional Autónoma de México, México

Dr. Juan Antonio Seda

Universidad de Buenos Aires, Argentina

Dr. Saulo Cesar Paulino e Silva

Universidad de Sao Paulo, Brasil

Dr. Miguel Ángel Verdugo Alonso

Universidad de Salamanca, España

Dr. Josep Vives Rego

Universidad de Barcelona, España

Dr. Eugenio Raúl Zaffaroni

Universidad de Buenos Aires, Argentina

Dra. Blanca Estela Zardel Jacobo

Universidad Nacional Autónoma de México, México

Comité Científico Internacional

Mg. Paola Aceituno

Universidad Tecnológica Metropolitana, Chile

Ph. D. María José Aguilar Idañez

Universidad Castilla-La Mancha, España

Dra. Elian Araujo

Universidad de Mackenzie, Brasil

Mg. Rumyana Atanasova Popova

Universidad Suroeste Neofit Rilski, Bulgaria

Dra. Ana Bénard da Costa

Instituto Universitario de Lisboa, Portugal

Centro de Estudos Africanos, Portugal

Dra. Alina Bestard Revilla

*Universidad de Ciencias de la Cultura Física y el
Deporte, Cuba*

Dra. Noemí Brenta

Universidad de Buenos Aires, Argentina

Dra. Rosario Castro López

Universidad de Córdoba, España

Ph. D. Juan R. Coca

Universidad de Valladolid, España

Dr. Antonio Colomer Vialdel

Universidad Politécnica de Valencia, España

Dr. Christian Daniel Cwik

Universidad de Colonia, Alemania

Dr. Eric de Léséulec

INS HEA, Francia

Dr. Andrés Di Masso Tarditti

Universidad de Barcelona, España

Ph. D. Mauricio Dimant

Universidad Hebrea de Jerusalén, Israel

Dr. Jorge Enrique Elías Caro

Universidad de Magdalena, Colombia

Dra. Claudia Lorena Fonseca

Universidad Federal de Pelotas, Brasil

Dra. Ada Gallegos Ruiz Conejo

Universidad Nacional Mayor de San Marcos, Perú

Dra. Carmen González y González de Mesa

Universidad de Oviedo, España

Ph. D. Valentin Kitanov

Universidad Suroeste Neofit Rilski, Bulgaria

Mg. Luis Oporto Ordóñez

Universidad Mayor San Andrés, Bolivia

Dr. Patricio Quiroga

Universidad de Valparaíso, Chile

Dr. Gino Ríos Patio

Universidad de San Martín de Porres, Per

Dr. Carlos Manuel Rodríguez Arrechavaleta

Universidad Iberoamericana Ciudad de México, México

Dra. Vivian Romeu

Universidad Iberoamericana Ciudad de México, México

Dra. María Laura Salinas

Universidad Nacional del Nordeste, Argentina

Dr. Stefano Santasilia

Universidad della Calabria, Italia

Mg. Silvia Laura Vargas López

Universidad Autónoma del Estado de Morelos, México

Dra. Jaqueline Vassallo

Universidad Nacional de Córdoba, Argentina

Dr. Evandro Viera Ouriques

Universidad Federal de Río de Janeiro, Brasil

Dra. María Luisa Zagalaz Sánchez

Universidad de Jaén, España

Dra. Maja Zawierzeniec

Universidad Wszechnica Polska, Polonia

Editorial Cuadernos de Sofía

Santiago – Chile

Representante Legal

Juan Guillermo Estay Sepúlveda Editorial

Indización, Repositorios y Bases de Datos Académicas

Revista Inclusiones, se encuentra indizada en:





REX



UNIVERSITY OF SASKATCHEWAN



Universidad de Concepción



BIBLIOTECA UNIVERSIDAD DE CONCEPCIÓN

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

Zarema M. Khasheva

North Caucasian Mining and Metallurgical Institute, Russia

Vladimir I. Golik

Southern Institute of Management, Russia

Nikolay P. Kravchenko

North Caucasian mining and Metallurgical Institute, Russia

Vladislav F. Milovanov

North Caucasian Mining and Metallurgical Institute, Russia

Zhanna A. Adamyán

North Caucasian Mining and Metallurgical Institute, Russia

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 Adamyán, 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 production¹. 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).

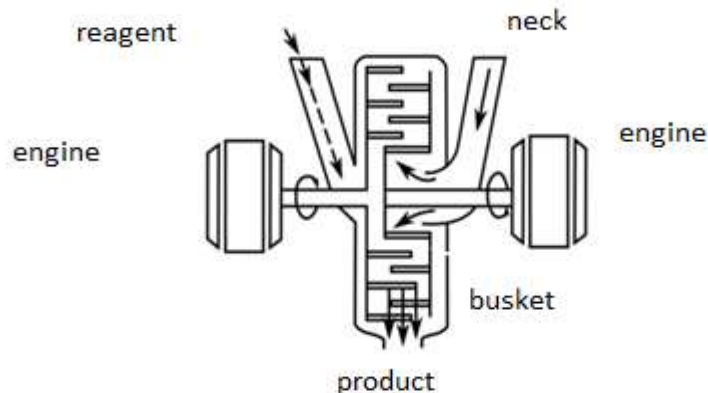


Fig. 1

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 metals².

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 claiming³ 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	astriгент	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 num 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).

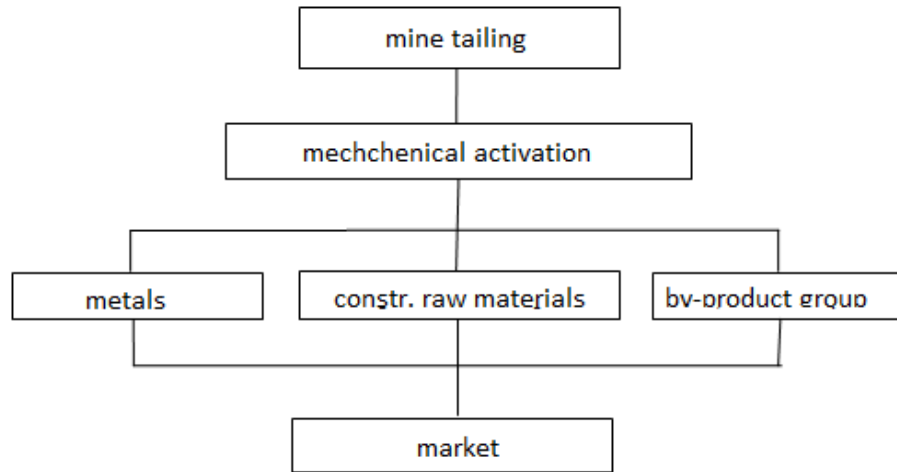


Fig. 2

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 others⁴.

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 coals⁵.

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.

⁵ E. Ben-Awuah; O. Richter; T. Elkington and Y. Pourrahimian, "Strategic mining options optimization: Open pit mining, underground mining or both". International Journal of Mining Science and Technology Vol: 26 Iss 6 (2016): 1065-1071.

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.

References

Babkin, V. V. and Uspensky, D. D. New strategy. Chemistry-2030. Advanced processing of raw materials. Clustering. Chemical fixation of the industry of the Russian Federation. Moscú: Face. 2015.

Ben-Awuah, E.; Richter, O.; Elkington, T. and Pourrahimian, Y. "Strategic mining options optimization: Open pit mining, underground mining or both". International Journal of Mining Science and Technology Vol: 26 Iss 6 (2016): 1065-1071.

Golik V.; Komashchenko V. and Morkun V. "Innovative technologies of metal extraction from the ore processing mill tailings and their integrated use". Metallurgical and Mining Industry nun 3 (2015): 49-52.

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

Golik V. I.; Razorenov, Yu. I. and Maslennikov, S. A. Protection of the natural geological environment utilization of tails of enrichment of ores. News of Tomsk Polytechnic University. Engineering of the georesources. 2015.

Komashchenko, V. I. Ecology-economic feasibility of utilization of mining waste for the purpose of their processing. News of the Tula state university. Sciences about Earth. 2015.

Stefanescu D. and Foidas I. 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.

CUADERNOS DE SOFÍA EDITORIAL

Las opiniones, análisis y conclusiones del autor son de su responsabilidad y no necesariamente reflejan el pensamiento de la **Revista Inclusiones**.

La reproducción parcial y/o total de este artículo debe hacerse con permiso de **Revista Inclusiones**.

ZAREMA M. KHASHEVA / VLADIMIR I. GOLIK / NIKOLAY P. KRAVCHENKO / VLADISLAV F. MILAVANOV
ZHANNA A. ADAMYAN