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REVIEW LETTER

To Whom It May Concern

The following describes the research "*The process obtaining of fire-explosion extinguishing powdering compounds investigation of on the base of industrial waste*" of Mrs Sapargaliyeva Bayan Oralkhanovna, who spent the academic summer semester in the 2018 year at the Valencia Polytechnic University as PhD Student.

The processing and wasting of industrial raw materials are becoming critical, most enterprises are seeking to create small and waste-free technologies. In particular, the questions of application of mineral fertilizers of phosphoric production are investigated and analyzed. Currently, in most foreign countries, due to the prevailing production and economic conditions, the processing of phosphogypsum and electro-thermal phosphorus slag is unprofitable and they are practically sent for storage (to specially designed facilities). The exception is made by the countries which do not have deposits of a raw mixtures. For example, in Spain, phosphogypsum and electro-thermal phosphorus slag produce about 25 building products and materials-gypsum binders, plasters, building mixes, adhesives, tiles, blocks, partitions, etc. They can also be used in the cement and chemical industry, agriculture and road construction. Dumps of phosphogypsum and electro-thermal phosphorus slag pollute the atmospheric air, underground and surface water, soil and vegetation with harmful substances. The issue of recycling of this material has been discussed and considered for a very long time. Phosphogypsum and electro-thermal phosphorus slag are available and they are of a low cost. It explains the huge interest of scientists and manufacturers to its utilization by developing of building materials and structures. Based on this, the issue of processing of phosphogypsum and electro-thermal phosphorus slag is particularly relevant.

By observation of shortage of natural raw materials of the phosphoric industry (phosphogypsum and electro-thermal phosphorus slag), new unconventional resources and production technologies have long been in need of search. However, the ways of utilization of phosphogypsum and electro-thermal phosphorus slag available in the world practice relate to



additional technological operations. It leads to considerable complication of technology and accordingly to additional capital expenses. As a result, they lie in landfills, and the most valuable macronutrients calcium, sulfur and other trace elements in huge quantities go to the dumps. Therefore, the urgent task of modern chemical science is to develop optimal technologies that ensure 100% use of phosphorus production waste and methods for obtaining qualitatively new materials with multifunctional properties.

To date, there is a fairly wide range of fire-fighting powders, in the application of standard fire extinguishing powder compositions are very expensive, substandard powder is used as fertilizer, however in this area is ongoing intensive work on the creation of new fire-explosion suppression compositions using new components and rational use of natural resources what is priority and relevance.

X-ray phase and chemical analyses of phosphogypsum and electro-thermal phosphorus slag were carried out because of optimal composition of new fire and explosion-suppressing compositions. Raw materials mixtures for fire and explosion-suppressing compositions were investigated and tested, and mathematical and computer modeling was performed.

The significance of the PhD Thesis of Mrs Bayan Sapargaliyeva at the national and international level is associated with the use of waste products of various industries, which will preserve and improve the environmental condition of industrial regions and ensure life safety, protect the environment, preserve natural, material and raw materials through the creation of waste-free production technologies, using phosphogypsum and electro-thermal phosphorus slag.

Bayan Sapargaliyeva passed academic mobility on the basis of the Valencian Polytechnic University (Valencia, Spain) in framework of her PhD fellowship. During the period of scientific research, PhD Student Bayan Sapargaliyeva conducted laboratory tests of the studied wastes of phosphorus production (phosphogypsum and electro-thermal phosphorus slag), carried out a patent search and worked in the University Library with scientific literature in accordance with the theme of the thesis. In the course of training on mobility, the contribution to the research work of the PhD student was as follows: the rational ratio of components in multipurpose fire-extinguishing mixtures based on expired powder with the addition of waste on their fire-extinguishing efficiency was determined; the indicators of endothermic efficiency of expired powders, industrial waste and recommended multipurpose fire-extinguishing mixtures were experimentally established. The methods allowing with enough reliability to define explosion-suppressing efficiency of pulverized materials are developed; presents the most detailed classification of the deterrents of combustion and explosion in the mechanisms of their action.

The experimental, calculated method of research and control of physical and chemical properties of powder compositions was used, the method of mathematical modeling was used. New flame-extinguishing compositions have been developed considering the scarcity and cheapness of raw materials (primarily waste products), simple manufacturing technology, low toxicity and environmental safety.



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During research Mrs Bayan Sapargaliyeva proved her competent, responsible and initiative specialist, able to perform tasks at a high level. The thesis attracts scientists and experts at the world level in the network of scientists around the world (Research Gate etc.) and there are prospects for international scientific cooperation on the topic of this work.

The presented research of Bayan Sapargaliyeva fully corresponds to the specialty 6D073100- Life Safety and Environmental Protection. The main investigation and results were reported and discussed at national and international scientific Conferences, presented in local and foreign scientific publications and in international Copyrights.

In summary, Mrs Bayan Sapargaliyeva has proven, during her PhD study at the Valencia Polytechnic University, to be a competent researcher, and I believe that this dissertation work fully meets all the requirements for PhD Thesis level, and PhD Student Bayan Sapargaliyeva deserves the degree of Philosophical Doctor (PhD) in the Specialty 6D073100- Life Safety and Environmental Protection.



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Research topics

- Solid Waste Management System Design:
 - Landfill design and operation
 - Composting facilities
 - Biomethanization plants
 - Solid waste recovery
 - Solid waste recycling techniques

- Environmental Pollution Modeling
 - Groundwater flow and transport modeling
 - Soil pollution modeling
 - Acoustic pollution
 - Environmental Impact Assessment Reports

Short Curriculum Vitae

Javier Rodrigo-Ilarri graduated in Civil Engineering in 1997 at the Universitat Politècnica de València (UPV). In 2004, he was awarded with the UPV extraordinary prize of the Ph.D. studies with his dissertation on flow and transport modeling of contaminants in fractured media.

Between 1998 and 1999 he held the position of Environmental Quality Engineer in the Waste and Pollution Service of the Department of the Environment of the Valencia Regional Government.

In 2005 he joined UPV as full-time professor at the Hydraulics & Environmental Engineering Department.

In 2008, through a scholarship from the Ministry of Education, he spent a year as a guest researcher in the Geothermal Group of the Center for Applied Geoscience of the Eberhard-Karls University of Tübingen (Germany), where he developed the application of geostatistical simulation techniques to superficial geothermal problems.

In 2012, he held the post of Technical Director of the Metropolitan Entity for Waste Treatment (EMTRE), being the highest technical responsible for the urban solid waste management facilities (treatment, recovery and disposal) in the metropolitan area of Valencia.

His main lines of research focus on the various fields of environmental engineering: groundwater pollution, environmental impact assessment, solid waste management and contaminated soils.

JAVIER RODRIGO-ILARRI - LIST OF SELECTED PUBLICATIONS

Author(s)	Title	Type of contribution	Journal - Book	Volume	Pages	ISBN	Publishing Co.	Year
1 Capilla, J.E. Rodrigo, J. Gómez, J.J.	Geostatistical structure of simulated transmissivity fields that honor piezometric data	Book chapter	IAMG'97 Proceedings	vol. 2	784-789	84-87867-97-9	CIMNE	1997
2 Capilla, J.E. Rodrigo, J. Gómez, J.J.	Worth of Secondary Data Compared to Piezometric Data for the Probabilistic Assessment of Radionuclide Migration	Research paper	Stochastic Hydrology and Hydraulics	vol. 12, nº 3	171-190		SPRINGER	1998
3 J. Rodrigo Ilarri	Estimation of hydrogeological parameters: An introduction to Geostatistics	Book chapter	Soil and Groundwater Pollution and Remediation		II-1, II-7	80-01-01817-2	Katedra hydrauliky a hydrologie, Fsv CVUT v Praze	1998
4 J. Rodrigo Ilarri	Incorporating Geophysical and Piezometric Information in Flow and Mass Transport Analysis at Aquifer Scale	Book chapter	Soil and Groundwater Pollution and Remediation		III-1, III-7	80-01-01817-2	Katedra hydrauliky a hydrologie, Fsv CVUT v Praze	1998
5 Capilla, J.E. Rodrigo, J. Gómez, J.J.	Simulation of non-gaussian transmissivity fields honoring piezometric data and integrating soft and secondary information	Research paper	Mathematical Geology	vol. 31, nº 7	907-927		SPRINGER	1999
6 J.E. Capilla J. Rodrigo J.J. Gómez-Hernández	Transporte de masa en medio fracturado: impacto del modelo estocástico de conductividad en las fracturas	Research paper	Boletín Geológico y Minero	vol. 114, nº 3	279-286		IGME	2003
7 J. Rodrigo Ilarri	Modelación del flujo y transporte de masa en medios fracturados: tratamiento de la heterogeneidad con aproximación de continuo y parámetros no multigaussianos	Full book	Ph.D. Dissertation	UMI: 3138677		0-493-55039-9		2004
8 Rodrigo, J. Gómez-Hernández, J.J.	A multigaussian kriging application to the environmental impact assessment of a new industrial site in Alcoy (Spain)	Book chapter	Quantitative Geology and Geostatistics	vol. 6	203-210	978-1-4020-6447-0	SPRINGER	2006
9 Rodrigo, J.	Energía nuclear. Aspectos medioambientales y desarrollo sostenible	Book chapter	Ciclo de Conferencias Luis Vives		161-178	978-84-871-157-5	Fundación BANCAJA	2009
10 Rodrigo-Ilarri, J. Rodrigo-Clavero, M.E.	Alternativas de valorización y eliminación de residuos sólidos urbanos	Full book				978-84-942396-1-8	ENTORNOS	2014
11 Rodrigo-Ilarri, J. Rodrigo-Clavero, M.E.	Desarrollo y aplicación de modelos de evaluación de la producción de lixiviados en vertederos de residuos sólidos urbanos	Book chapter	CIAS 2014 Proceedings		781-792	978-84-9048-239-1	UPV	2014
12 Rodrigo-Ilarri, J. Reisinger, M. Gómez-Hernández, J.J.	Influence of heterogeneity on Heat Transport Simulations in Shallow Geothermal Systems	Book chapter	Geostatistics Valencia 2016	vol. 5	849-862	978-3-319-46818-1	SPRINGER	2016
13 Rodrigo-Clavero, M.E. Ballesteros-Almonacid, L.	Modeling soil transport of pesticides using different one-dimensional vadose zone numerical approximations	Book chapter	Impacts of Global Change on Western Mediterranean Aquifers		141-146	978-84-338-6152-8	IAH-GE	2017
14 Rodrigo-Ilarri, J. Rodrigo-Clavero, M.E.	Impact of climate change on the leachate production of a bioreactor landfill	Book chapter	Impacts of Global Change on Western Mediterranean Aquifers		219-225	978-84-338-6152-8	IAH-GE	2017
15 Rodrigo-Ilarri, J. Romero-Ballesteros, L. Rodrigo-Clavero, M.E.	Modelación matemática de la concentración de BTEX en la zona no saturada: evaluación de la distribución de masa entre las fases	Book chapter	Agua Subterránea, Medio Ambiente, Salud y Patrimonio		497-506	978-84-938046-6-4	IAH-GE	2018
16 Bayan Sapargaliyeva Aigul Naukenova Bakhyt Allipova Javier Rodrigo-Ilarri	Flame Distribution and Attenuation in Narrow Channels Using Mathematical Software	Research paper	Advances in Science, Technology and Engineering Systems Journal	vol. 4	53-57	ISSN: 2415-6698	ASTESJ	2019

Recent Submissions

Author(s)	Title	Type of contribution	Journal - Book	Volume	Pages	ISBN	Publishing Co.	Year
Solano Meza, J.K. Rodrigo-Ilarri, J. Romero Hernández, C.P. Rodrigo-Clavero, M.E.	Analytical methodology for the identification of critical zones on the generation of solid waste in large urban areas	Research paper	Environment, Development and Sustainability				SPRINGER	2019