7. ОСТАЛИ ДОКАЗИ КАНДИДАТА МИЛИЋ ЕРИЋА
ЗА ИЗБОР У ЗВАЊЕ ВИШИ НАУЧНИ САРАДНИК

ЦИТИРАНОСТ ПРИЛОЖЕНИХ РАДОВА - Цитираност по евиденцији индексне база Scopus на дан 28.05.2023.

Цитираност радова др Милић Ерића (извор: Scopus, Author ID: 16039135800)
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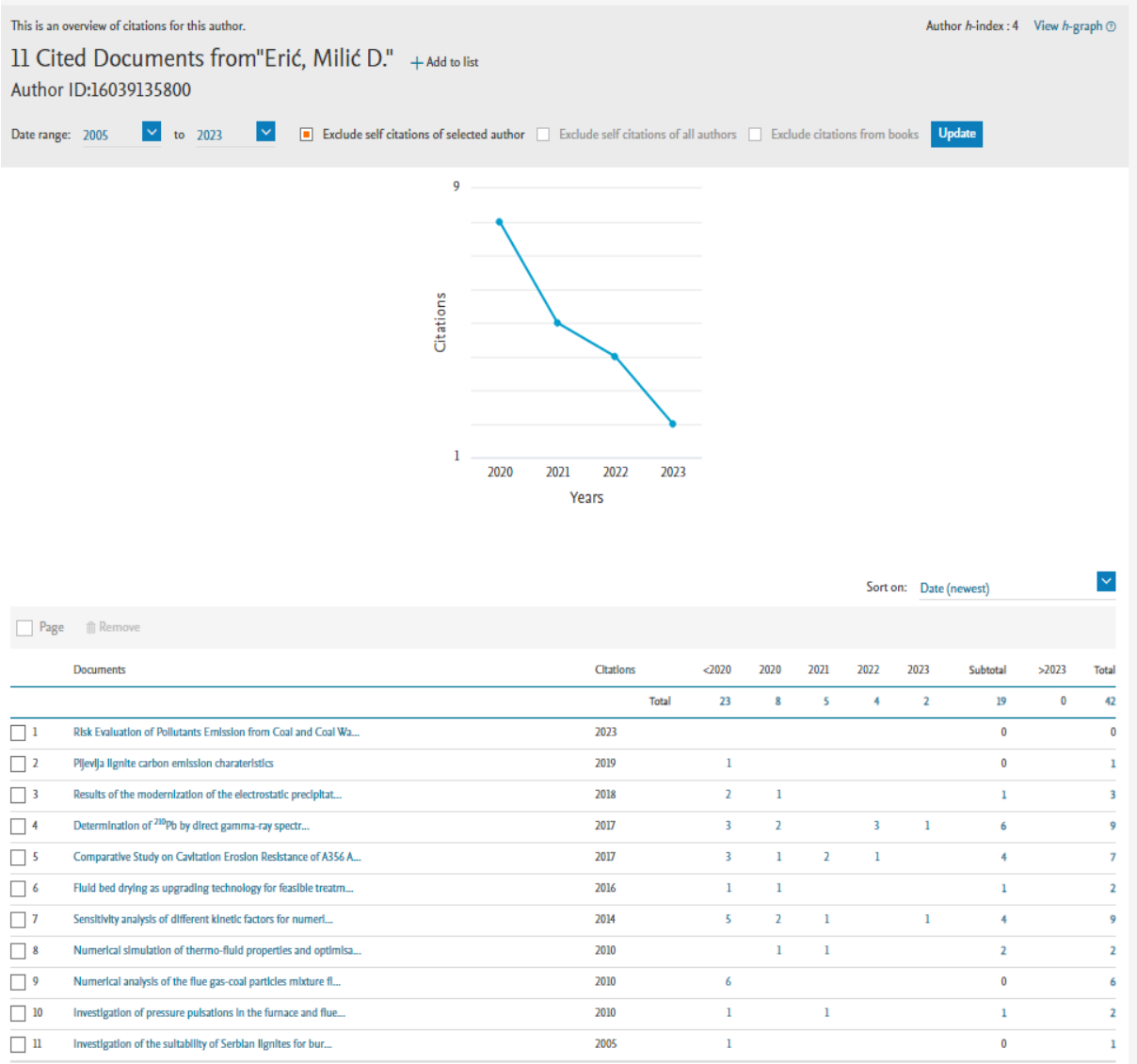

	Documents	Citations	<2020	2020	2021	2022	2023	Subtotal	>2023	Total
		Total	23	8	5	4	2	19	0	42
1	Risk Evaluation of Pollutants Emission from Coal and Coal Wa...	2023						0		0
2	Pljevlja lignite carbon emission charateristics	2019	1					0		1
3	Results of the modernization of the electrostatic precipitat...	2018	2	1				1		3
4	Determination of ^{210}Pb by direct gamma-ray spectr...	2017	3	2		3	1	6		9
5	Comparative Study on Cavitation Erosion Resistance of A356 A...	2017	3	1	2	1		4		7
6	Fluid bed drying as upgrading technology for feasible treatm...	2016	1	1				1		2
7	Sensitivity analysis of different kinetic factors for numeri...	2014	5	2	1		1	4		9
8	Numerical simulation of thermo-fluid properties and optimisa...	2010		1	1			2		2
9	Numerical analysis of the flue gas-coal particles mixture fl...	2010	6					0		6
10	Investigation of pressure pulsations in the furnace and flue...	2010	1		1			1		2
11	Investigation of the suitability of Serbian lignites for bur...	2005	1					0		1

Рад у међународном часопису изузетних вредности М21а
R. Jovanović, D. Cvetinović, M. Erić, B. Rašuo, M. Adžić, Sensitivity analysis of different kinetic factors for numerical modeling of Serbian lignite devolatilisation process, Heat and Mass Transfer Journal, 72 (2014), pp. 489-500, ISSN 0947-7411, http://dx.doi.org/10.1016/j.ijheatmasstransfer.2014.01.036.
Број хетероцитата 9

1. Li, F., Feng, J., Zhang, H., Li, W.-Y., Particle-scale heat and mass transfer processes during the pyrolysis of millimeter-sized lignite particles with solid heat carriers, Applied Thermal Engineering, Volume 219, Part A, 25 January 2023, Article 119372
2. Milovanović, Z.N., Papić, L.R., Milovanović, S.Z., Janičić Milovanović, Valentina Z., Dumonjić-Milovanović, S.R., Branković, D.L, Methods of risk modeling in a thermal power plant (Book Chapter). The Handbook of Reliability, Maintenance, and System Safety through Mathematical Modeling, 2021, pp. 315-372.
3. Yadav, Sujeet, Mondal S.S., Numerical investigation of the influence of operating parameters on NO_x emission characteristics under oxy-coal combustion atmosphere in a tubular combustor, International Communications in Heat and Mass Transfer Volume 119, december 2020, Article number104915.
4. Yadav, Sujeet, Mondal S.S., Modelling of oxy-pulverized coal combustion to access the influence of steam addition on combustion characteristics, Fuel, Volume 271, 1 July 2020 Article number 117611
5. Stefanovic, P. Lj., Cvetinovic, D.B., Markovic, Z. J.,Eric, M. D.,Oka, S. N. Repic, B. S., Review of the investigations of pulverized coal combustion processes in large power plants in Laboratory for Thermal Engineering and Energy-Part B, Thermal Science, Open Access, Volume 23, Pages S1611 - S1626, 2019.
6. Richter, H., Mamić, J., Morsy, M., ;Jhnig, K., Trautmann, C., Werner, A., Coke production from low rank coals, Low-rank Coals for Power Generation, Fuel and Chemical Production, Pages 269 – 299, 1 January 2017.
7. Lemaire, R., Menage, D., Seers, P., Study of the high heating rate devolatilization of bituminous and subbituminous coals—Comparison of experimentally monitored devolatilization profiles with predictions issued from single rate, two-competing rate, distributed activation energy and chemical percolation devolatilization models, Journal of Analytical and Applied Pyrolysis, Volume 123, Pages 255 – 268, 1 January 2017.
8. Jovanović, R.D., Cvetinović, D.B., Stefanović, P.L., Škobalj, P.D., Marković, Z.J. , NOVEL FRAGMENTATION MODEL FOR PULVERIZED COAL PARTICLES GASIFICATION IN LOW TEMPERATURE AIR THERMAL PLASMA, Thermal Science, Open Access, Volume 20, Pages S207 - S221, 2016.
9. Jovanović, R.D., Cvetinović, D.B., Stefanović, P.L., Škobalj, P.D., Marković, Z.J. , Novel fragmentation model for pulverized coal particles gasification in low temperature air thermal plasma, Thermal Science, Volume 20, Pages s207 - s221 2016.

Рад у истакнутом међународном часопису М22

1. Bojan Šešlak, Ivana Vukanac, Aleksandar Kandić, Mirjana Đurašević, Milić Erić, Aleksandar Jevremović, Ljudmila Benedik, Determination of ^{210}Pb by direct gamma-ray spectrometry, beta counting via ^{210}Bi and alpha-particle spectrometry via ^{210}Po in coal, slag and ash samples from thermal power plant, J Radioanal Nucl Chem (2017) 311:719–726, DOI 10.1007/s10967-016-5028-6

Број хетероцитата 9

1. Aharon, P., Van Gent, D.L., Fu, B., Age-dating and assumptions testing of 226Ra and 228Ra decay series applied to barite chimneys and mud volcanoes in deepwater Gulf of Mexico, Chemical Geology, Volume 630, 20 July 2023, Article 121485.
2. Xarchoulakos, D.C., Manoutsoglou, E., Kallithrakas-Kontos, N.G., Distribution of uranium isotopes, 210Pb and 210Po in groundwaters of Crete- Greece, Journal of Radioanalytical and Nuclear Chemistry, Published 22 October 2022, https://doi.org/10.1007/s10967-022-08578-6
3. Vukanac, I., Šešlak, B., Kandić, A., Čeliković, I., Nikolić-Mladenović N., Milanović T., Obradović, Z., Đurašević, M., A comparison of alpha-particle and gamma-ray spectrometry methods for determination of ^{235}U, ^{238}U and ^{226}Ra activity concentration in samples of coal,

slag and fly-ash, Radiation Physics and Chemistry, Volume 193, April 2022 Article number 109933.

4. Tian, J., Yang, W., Chen, M., Zheng, M., Chen, D., Qiu, Y., Auto-deposition of ^{210}Bi and ^{210}Po on nickel discs and their application in the analysis of natural waters, Journal of Radioanalytical and Nuclear Chemistry, Volume 331, Issue 2, Pages 1039 – 1049, February 2022.
5. Moniakowska, A., Olszewski, G., Block, K., Strumińska-Parulska, D., The level of ^{210}Pb extraction efficiency in Polish herbal teas and the possible effective dose to consumers, Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering, Volume 55, Issue 2, Pages 161 – 167, 28 January 2020.
6. Thakur, P., Ward, A.L., ^{210}Po in the environment: insight into the naturally occurring polonium isotope, Journal of Radioanalytical and Nuclear Chemistry, Volume 323, Issue 1, Pages 27 - 491 January 2020.
7. Olszewski, G., Boryło, A., Skwarzec, B., Strumińska-Parulska, D., Is human hair a proper 210 Po and 210 Pb monitor of their increased activity in the human body?, Journal of Radioanalytical and Nuclear Chemistry, Open Access, Volume 319, Issue 3, Pages 953 – 963, 15 March 2019.
8. Avramović, D., Čeliković, I., Ujić, P., Vukanac, I., Kandić, A., Jevremović, A., Antonijević, D., Lončar, B., Radon exhalation rate of some building materials common in Serbia, RAD Conference Proceedings, Open Access, Volume 3, Pages 119 – 122, 19 February 2019, 6th International Conference on Radiation and Applications in Various Fields of Research, RAD 2018, Ohrid, 18 June 2018through 22 June 2018, Code 149557.
9. Gałuszka, A., Migaszewski, Z.M., Namieśnik, J., The role of analytical chemistry in the study of the Anthropocene, TrAC - Trends in Analytical ChemistryVolume 97, Pages 146 – 152, December 2017.

Рад у истакнутом међународном часопису М22

Vesna M. Maksimović, Aleksandar B. Devenčerski, Anja Došen, Ilija Bobić, Milić D. Erić, Tatjana Volkov-Husović, Comparative Study on Cavitation Erosion Resistance of A356 Alloy and A356FA5 Composite, Trans Indian Inst Met (2017) 70(1):97–105, DOI 10.1007/s12666-016-0864-1

Број хетероцитата 7

1. Muslić, M., Orešković, L., Rede, V., Maksimović, V., Indentation Size Effect of Composite A356 + 6%FA Subjected to ECAP, Metals, Open Access, Volume 12, Issue 5, May 2022, Article number 821.
2. Szala, M., Awtoniuk, M., Latka, L., MacEk, W., Branco, R., Artificial neural network model of hardness, porosity and cavitation erosion wear of APS deposited Al2O3 -13 wt% TiO2 coatings, Journal of Physics: Conference Series, Open Access, Volume 1736, Issue 1, 25 January 2021, Article number 012033, 5th International Conference of Computational Methods in Engineering Science, CMES 2020, Lublin, 23 November 2020through 26 November 2020, Code 167307.
3. Muslić, M., Rede, V., Maksimović, V., Solid particle erosion resistance of al alloy and al alloy-fly ash composite subjected to equal-channel angular pressing, Metallurgical and Materials Engineering, Open Access, Volume 27, Issue 1, Pages 15 – 26, 2021.
4. Szala, M., Łatka, L., Awtoniuk, M., Winnicki, M., Michalak, M., Neural modelling of aps thermal spray process parameters for optimizing the hardness, porosity and cavitation erosion resistance of al2o3-13 wt% tio2 coatings, Processes, Open Access, Volume 8, Issue 12, Pages 1 – 15, December 2020, Article number 1544.
5. More, S.R., Bhatt, D.V., Menghani, J.V., Effect of Microstructure and Hardness on Slurry Erosion Behaviour of A356 Alloy Using Slurry Pot Test Rig, Transactions of the Indian Institute of Metals, Volume 72, Issue 12, Pages 3191 – 3199, 1 December 2019.

6. Li, K., Zhai, X., Guan, F., (...), Duan, J., Hou, B., Progress on materials and protection technologies for marine propeller, Journal of the Chinese Society of Corrosion and Protection, Volume 37, Issue 6, Pages 495 – 503, December 2017, Article number 1005-4537(2017)06-0495-09.
7. Li, J., Jin, F., Ma, Y., Research on damage repair and reinforcement of deep foundation pit support structure based on fractal dimension theory, Chemical Engineering Transactions, Volume 59, Pages 445 – 450, 2017.

Рад у међународном часопису М23

Nikola V. Živković, Dejan B. Cvetinović, Milić D. Erić, Zoran J. Marković: "Numerical analysis of the flue gas-coal particles mixture flow in burner's distribution channels with regulation shutters at the TPP Nikola Tesla - A1 utility boiler", Thermal Science 2010 Volume 14, Issue 2, Pages: 505-520, UDC: 662.612:533.6.011:519.61, DOI:10.2298/TSCI1002505Z.

Број хетероцитата 6

1. Stefanovic, P. Lj., Cvetinovic, D.B., Markovic, Z. J.,Eric, M. D.,Oka, S. N. Repic, B. S., Review of the investigations of pulverized coal combustion processes in large power plants in Laboratory for Thermal Engineering and Energy-Part B, Thermal Science, Open Access, Volume 23, Pages S1611 - S1626, 2019.
2. Kozić, M., Ristic, S., Puharic, M., Katavić, B., Possibilities of redesigning the louvre separator in the air mixing duct of a thermal plant using numerical simulation, Progress in Computational Fluid Dynamics, Volume 14, Issue 3, Pages 151 – 165, 2014.
3. Kozić, M., Ristić, S., Puharić, M., Linić, S., CFD analysis of the influence of centrifugal separator geometry modification on the pulverized coal distribution at the burners, Transactions of Famena, Volume 38, Issue 1, Pages 25 – 36, 2014.
4. Kapitler, M., Samec, N., Kokalj, F., Computational fluid dynamics calculations of waste-to-energy plant combustion characteristics, Thermal Science, Open Access, Volume 15, Issue 1, Pages 1 – 16, 2011.
5. Kozić, M.S., Ristić, S.S., Puharić, M.A., Katavić, B.T., Numerical simulation of multiphase flow in ventilation mill and channel with louvers and centrifugal separator, Thermal Science, Open Access, Volume 15, Issue 3, Pages 677 – 689, 2011.
6. Saidur, R., Energy savings and emission reductions in industrial boilers, Thermal Science, Open Access, Volume 15, Issue 3, Pages 705 – 719, 2011.

Рад у истакнутом међународном часопису М22

Milić D. Erić, Predrag Lj. Stefanović, Zoran J. Marković, Rastko D. Jovanović, Ivan M. Lazović, Nikola V. Živković, Željko S. Ilić, RESULTS OF THE MODERNIZATION OF THE ELECTROSTATIC PRECIPITATOR AT UNIT B1 OF THE THERMAL POWER PLANT KOSTOLAC B, THERMAL SCIENCE: Year 2018, Vol. 22, Suppl. 5, pp. S1623-S1634, https://doi.org/10.2298/TSCI18S5623E.

Број хетероцитата 3

1. Xu, L., Shi, H., Wang, L., Xiao, W., Li, Q., Guo, J., Efficiency characteristic of electrostatic dust precipitation using solar energy, Thermal Science, Open Access, Volume 24, Pages 2857 – 2864, 2020.
2. Kaminska, K., Dzierwa, P., THE INFLUENCE OF COMPACTION AND SATURATION ON THE COMPRESSIBILITY OF COLLIERY WASTE, Thermal Science, Open Access, Volume 23, Pages 1345 – 1355, 2019.
3. Stefanovic, P. Lj., Cvetinovic, D.B., Markovic, Z. J.,Eric, M. D.,Oka, S. N. Repic, B. S., Review of the investigations of pulverized coal combustion processes in large power plants in Laboratory for Thermal Engineering and Energy-Part B, Thermal Science, Open Access, Volume 23, Pages S1611 - S1626, 2019.

Рад у истакнутом међународном часопису М22

1. Milić D. ERIĆ, Milan B. STAKIĆ, and Miloš J. BANJAC, FLUID BED DRYING AS UPGRADING TECHNOLOGY FOR FEASIBLE TREATMENT OF KOLUBARA LIGNITE, THERMAL SCIENCE, Year 2016, Vol. 20, Suppl. 1, pp. S167-S181, DOI: 10.2298/TSCI150725172E.

Број хетероцитата 2

1. Carrera-Escobedo, J., Cruz-Domínguez, O., Guzmán-Valdivia, C., Carrera-Escobedo, V., García-Ruiz, M., Durán-Muñoz, H., Cost analysis of drying process by studying its kinetic parameters: A new study in Mexican chillies, Czech Journal of Food Sciences, Open Access, Volume 38, Issue 6, Pages 375 – 387, 2020.
2. Stefanovic, P. Lj., Cvetinovic, D.B., Markovic, Z. J.,Eric, M. D.,Oka, S. N. Repic, B. S., Review of the investigations of pulverized coal combustion processes in large power plants in Laboratory for Thermal Engineering and Energy-Part B, Thermal Science, Open Access, Volume 23, Pages S1611 - S1626, 2019.

Рад у међународном часопису М23

M. D. Erić, Dejan B. Cvetinović, P. Stefanović, P. M. Radovanović,N. V. Živković, Investigation of pressure pulsations in the furnace and flue gas tract of the pulverized coal combustion utilitz boiler, Thermal Science, Year 2010, Vol. 14, No.1, pp261-270, UDC: 662.95/.96 DOI: 10.2298/TSCI1001261E.

Број хетероцитата 2

1. Chen, Z., Zhong, W., Chen, X., Zhao, D., Sun, Y., Study on pressure distribution characteristics of main-pipeline flue in power plants and construction of guidance system, Dongnan Daxue Xuebao (Ziran Kexue Ban)/Journal of Southeast University (Natural Science Edition), Volume 51, Issue 6, Pages 1049 – 1059, 20 November 2021.
2. Stefanovic, P. Lj., Cvetinovic, D.B., Markovic, Z. J.,Eric, M. D.,Oka, S. N. Repic, B. S., Review of the investigations of pulverized coal combustion processes in large power plants in Laboratory for Thermal Engineering and Energy-Part B, Thermal Science, Open Access, Volume 23, Pages S1611 - S1626, 2019.

Рад у врхунском часопису националног значаја М51

Živković S. Goran, Mirkov S. Nikola, Dakić V., Dragoljub, Mladenović R. Milica, Erić M. Aleksandar, Erić D. Milić, Rudonja R. Nedžad, Numerical Simulation of Thermo-Fluid Properties and Optimisation of Hot Water Storage Tank in Biomass Heating Systems, FME TRANSACTIONS (2010), Vol. 38(2), pp 63-70, ISSN 1451-2092, UDC: 621.

Број хетероцитата 2

1. Rehman, S., Aliyu, K.N., Alhems, L.M., Mohandes, M., A., Himri, Y., Allouhi, A., Mahbub, M.A., A Comprehensive Global Review of Building Integrated Photovoltaic Systems, FME Transactions, Open Access, Volume 49, Issue 2, Pages 253 – 268, 2021.
2. Bezari, S., Bekkouche, S.M.E.A., Benchatti, A., Investigation and Improvement for a Solar Greenhouse Using Sensible Heat Storage Material, FME Transactions, Open Access, Volume 49, Issue 1, Pages 154 – 162, October 2020.

Рад у истакнутом међународном часопису М22

Predrag Lj. Stefanović, Nikola V. Živković, Dragoslava D. Stojiljković, Vladimir V. Jovanović, Milić D. Erić, Zoran J. Marković, Dejan B. Cvetinović, PLJEVLJA LIGNITE CARBON EMISSION CHARATERISTICS, THERMAL SCIENCE: Year 2019, Vol. 23, Suppl. 5, pp. S1523-S1531, https://doi.org/10.2298/TSCI180726288S.

Број хетероцитата 1

1. Stefanovic, P. Lj., Cvetinovic, D.B., Markovic, Z. J.,Eric, M. D.,Oka, S. N. Repic, B. S., Review of the investigations of pulverized coal combustion processes in large power plants

in Laboratory for Thermal Engineering and Energy-Part B, Thermal Science, Open Access, Volume 23, Pages S1611 - S1626, 2019.

Саопштење са међународног скупа штампано у целини М33

Oka S., Grubor B., Dakic D., Ilic M., Manovic V., Eric M., Paprika M., Oka, N., Belosevic, S., Mladenovic, R., Crnomarkovic N., Investigation of the suitability of Serbian lignites for burning in CFBC boilers, Proceedings of the 18th International Conference on Fluidized Bed Combustion, 22-25 May 2004, Toronto, Canada.

Број хетероцитата 1

1. Manovic, V., Loncarevic, D., Tokalic, R., Particle-to-particle heterogeneous nature of Coals A case of large coal particles, Energy Sources, Part A: Recovery, Utilization and Environmental Effects, Volume 31, Issue 5, Pages 427 – 437, 2009.

Рад који није у саставу претходног профила због замене имена и презимена

Рад у истакнутом међународном часопису М22

Predrag D. Škobalj, Mirjana LJ. Kijevčanin, Marina P. Jovanović, Naim H. Afgan, Milić D.Erić, ENERGY INDICATORS IMPACT IN MULTI-CRITERIA SUSTAINABILITY ANALYSE OF THERMAL POWER PLANT UNIT, THERMAL SCIENCE, Year 2017, Vol. 21, No. 2, pp. 1143-1151, https://doi.org/10.2298/TSCI160215178S

Број хетероцитата 1

1. Jovanović, M., Bakić, V., Vučićević, B., Turanjanin, V., Analysis of different scenarios and sustainability measurement in the district heating sector in Serbia, Thermal Science, Open Access, Volume 2018, Pages 2085 – 2096, 2018.

ПОТВРДА О АНАГАЖОВАЊУ НА ТЕМИ

ИНСТИТУТ ЗА НУКЛЕАРНЕ НАУКЕ "ВИНЧА"
ИНСТИТУТ ОД НАЦИОНАЛНОГ ЗНАЧАЈА ЗА РЕПУБЛИКУ СРБИЈУ
УНИВЕРЗИТЕТ У БЕОГРАДУ

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Ваш знак: Наш знак: 601-188/2023-140 Београд-Винча, 29.05.2023.

ПОТВРДА

О УЧЕШЋУ НА ИСТРАЖИВАЧКОЈ ТЕМИ

Потврђује се да је научни сарадник **Милић Д. Ерић** учесник на теми "Унапређење ефикасности опреме за пречишћавање отпадних гасова и експлоатационих процеса, повећањем квалитета горива и процена утицаја на аерозагађење околине" у оквиру програма ЕНЕРГИЈА И ЕНЕРГЕТСКА ЕФИКАСНОСТ са 12 истраживач месеци.

Руководилац теме

др Зоран Марковић

Директор Института "Винча"

Проф. др Снежана Наговић

ВИНЧА

МЕЂУНАРОДНА САРАДЊА

Učešće na međunarodnom projeku FP6, RECOFUEL 2004-2005 i 2007-2008

INSTITUTE OF NUCLEAR SCIENCES - VINČA
LABORATORY FOR THERMAL ENGINEERING AND ENERGY
11001 Belgrade, Serbia, P.O. Box 522
Tel: (+381 11) 344 3498; Fax: (+381 11) 245 3670; e-mail: ite@vin.bg.ac.yu

Your no.: Our no.: Date: 26.VI.2004.

DECISION

Related To The Formation Of VINCA Team Force For Realization Of RECOFUEL Project, For The Period June 2004 – June 2005

in Serbian:

Ovom odlukom se imenuju sledeći istraživači, zaposleni u Laboratoriji za termotehniku i energetku Instituta za nuklearne nauke – Vinča, da učestvuju na realizaciji aktivnosti na projektu EU FP6 "RECOFUEL" u periodu juni 2004. - juni 2005.:

Njihovo angažovanje i planirana plata za jun 2004 – jun 2005 data je u Anexu I ove Odluke.

in English:

By this Decision the following researchers, employees of the Laboratory for Thermal Engineering and Energy of the Institute for Nuclear Sciences – Vinca, will be engaged to realize the activities on the project EU FP6 "RECOFUEL", in period from June 2004 to June 2005.:

Their engagement and target salary for the period from June 2004 - June 2005. is given in Annex I of this Decision.

1. Predrag Radovanović
2. Dejan Cvetinović
3. Zoran Pavlović
4. Stefanović Predrag
5. Goran Živković
6. Nikola Živković
7. Milić Erić
8. Zoran Marković
9. Maja Studović
10. Marina Jovanović
11. Milada Pezo

VINCA Team Leader on Project "RECOFUEL"
Dr.Sci. Predrag Radovanović

Director of Laboratory for Thermal Engineering and Energy
Institute for Nuclear Sciences - Vinca
Dr.Sci. Borislav Grubor

ИТЕ

Učešće na međunarodnom projeku FP6, RECOFUEL 2004-2005 i 2007-2008

INSTITUTE OF NUCLEAR SCIENCES - VINČA
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11001 Belgrade, Serbia, P.O. Box 522
Tel: (+381 11) 344 3498; Fax: (+381 11) 245 3670; e-mail: ite@vin.bg.ac.yu

Your no.: Our no.: Date: 21.V.2007.

DECISION

Related To The Formation Of VINCA Team Force For Realization Of RECOFUEL Project, For The Period June 2007 – June 2008

in Serbian:

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2. Dejan Cvetinović
3. Stefanović Predrag
4. Goran Živković
5. Vuk Spasojević
6. Nikola Živković
7. Miroslav Sijerčić
8. Milan Rajković
9. Žana Stefanović
10. Žarko Stefanović
11. Stevan Nemoda
12. Valentina Turanjanin
13. Milić Erić
14. Maja Studović
15. Marina Jovanović
16. Milada Pezo

VINCA Team Leader on Project "RECOFUEL"
Dr.Sci. Predrag Radovanović

Director of Laboratory for Thermal Engineering and Energy
Institute for Nuclear Sciences - Vinca
Dr.Sci. Borislav Grubor

ИТЕ

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PIB: 101877940; **PDV:** 131134636; **Din. rč.:** 840-634666-46 – Trezor Republike Srbije
Dev. rč. (eur): 265-77-166 kod Raiffeisenbank a.d. Beograd, **Intermediary bank:** DEUTDEFF Deutsche bank AG, Frankfurt am Main de; **Account with institution:** RZBJCSBG Raiffeisenbank Bulevar AVNOJ-a 64a Novi Beograd; **Beneficiary customer:** CS73265100000000077166 Institut za nuklearne nauke VINCA, Beograd

Učešće na međunarodnom projeku FP6, RECOFUEL 2004-2005 i 2007-2008

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Projektmanagement
Telefon: +49(0)2235/9251-258
Telefax: +49(0)2235/9251-259
E-Mail: thomas.glorius@remondis.de

Erftstadt, 2010-06-11/Glo

Confirmation participation RECOFUEL

Dear Dr. Radovanovic,

with this letter we would like to thank you for your participation within the EU-project RECOFUEL.

VINCA contributed significantly to the success of the RECOFUEL-project and the demonstration of direct Solid Recovered Fuel (SRF) co-combustion in pulverized fuel power plants and implementation of a sustainable waste-to-energy technology in large-scale energy production) - Project no. TREN/04/FP6EN/S07.32813/503184) - during 02/06/2004-31/05/2008 time period.

Thank you and kind regards

REMONDIS GmbH Rheinland

REMONDIS
REMONDIS

i.V. Dr. Glorius

Dr. Thomas Glorius

(Project Coordinator and authorized agent)

Учешће на међународном пројекту

Институт за нуклеарне науке "Винча";
Институт од националног значаја за Републику Србију
Универзитет у Београду
Мике Петровића Аласа 12-14
Винча – Београд

ПОТВРДА О УЧЕШЋУ НА БИЛАТЕРАЛНОМ ПРОЈЕКТУ

Овим потврђујем да су сарадници Лабораторије за термотехнику, Института за нуклеарне науке "Винча"; Институт од националног значаја за Републику Србију, Универзитет у Београду:

1. Дејан Цветиновић,
2. Александар Ерић,
3. Предраг Шкобаљ,
4. Зоран Марковић,
5. Милић Ерић и
6. Растко Јовановић,

учествовали на билатералном пројекту научне и технолошке сарадње под називом "Study of the fire behavior and flame inhibition of electrical cable for most demanding applications" између Републике Србије (Институт за нуклеарне науке "Винча"; Институт од националног значаја за Републику Србију) и Нартодне Републике Кине (Nanjing University of Science and Technology) за период 2015-2016, који је са српске стране финансирало Министарство просвете, науке и технолошког развоја Републике Србије.

Потврда се издаје у сврху избора у научно звање.

Винча – Београд, 05.10.2022.

Др Дејан Цветиновић,
Руководилац билатералног
пројекта са српске стране

Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije
Sektor za evropske integracije i razvojne i istraživačke programe i projekte u obrazovanju i nauci
Odsek za razvojne i istraživačke programe i projekte u nauci i obrazovanju
Konkurs za sufinansiranje naučne i tehnološke saradnje između R. Srbije i N. R. Kine 2015– 2016.
Nemanjina 22-26
11 000 Beograd

Na ruke:

Mr Svetlana Bogdanović

Ministarstvo prosvete, nauke i tehnološkog razvoja
11000 Beograd,
Nemanjina 22 – 26

Tel/Faks: +381 11 3616 529
svetlana.bogdanovic@mpn.gov.rs

Prijava sa kineske strane (rezime)

说明：1. 本表共计有13栏，请按照要求分别以中英文填写。
2. 填写申请人姓名时，不要加任何头衔，请如 Mr., Dr., Prof. 等。
3. 填写中方申请人英文姓名时，姓前名后，如“李时珍”写为“Li Shizhen”。填写中方联系电话/传真时，格式为“区号-电话/传真”。
4. 本表仅提交电子文件，不必打印。

项目名称	外方单位（中文）	外方申请人姓名（英文）	中方单位	中方申请人姓名	中方联系方式	推荐部门	中方申请人手机	Project Title	Overseas Organization	Name of Overseas Applicant	Chinese Organization	Name of Chinese Applicant
专用电缆火行为及阻燃方法研究	Vinca核科学研究所	Dejan Cvetinovic	南京理工大学	徐强	电话：025-84315125 传真：025-84315831 电邮：kentgru@hotmail.com	江苏省科技厅	13404160644	Study the fire behavior and flame inhibition of electrical cable	Vinca Institute of Nuclear Sciences	Dejan Cvetinovic	Nanjing University of Science and	Xu Qiang

Research area:
Safety Science

Title:
Study the fire behavior and flame inhibition of electrical cable for most demanding applications

Keywords:
fire behavior, flame inhibition, electrical cable, safety of energy transfer

SERBIAN INSTITUTION:

Institution:
Vinca Institute of Nuclear Sciences

Department:
Laboratory for Thermal Engineering and Energy

Address:
Mike Petrovića Alasa 12-14, 11351 Vinča, Beograd

Phone:
+381-11-3408-201

Fax:
+381-11-6453-670

Public institution:
Yes

Fiscal number:
101877940

Bank account:
840-634666-46

SERBIAN PRINCIPAL INVESTIGATOR

First name:
Dejan

Last name:
Cvetinović

Position:
PhD, Research Associate

Address:
Mike Petrovića Alasa 12-14, 11351 Vinča, Beograd

Phone:
+381-11-3408-631

Fax:
+381-11-6453-670

.2013.02.033 I.F. 4,159 (2013); 13/82 (Energy&Fuels) (2013) 6. Mikulandrić Robert, Lončar Dražen, Cvetinović Dejan, Spiridon Gabriel, Schneider Daniel R.: "Improvement of environmental aspects of thermal power plant operation by advanced control concepts", Thermal Science, 2012 Volume 16, Issue 3, Pages: 759-772, doi:10.2298/TSCI120510134M I.F. 0,962 (2013); 27/55 (Thermodynamics) (2013) 7. Stefanović Predrag Lj., Marković Zoran J., Bakić Vukman V., Cvetinović Dejan B., Spasojević Vuk D., Živković Nikola V.: "Evaluation of Kolubara lignite carbon emission characteristics", Thermal Science, 2012 Volume 16, Issue 3, Pages: 805-816, doi:10.2298/TSCI120215130S I.F. 0,962 (2013); 27/55 (Thermodynamics) (2013)

SERBIAN RESEARCH GROUP:

Aleksandar Erić, PhD, research associate
Zoran Marković, MSci, researcher
Milić Erić, MSci, researcher
Predrag Škobalj, BE, researcher
Rastko Jovanović, PhD, research associate

Biography:

The Laboratory for Thermal Engineering and Energy is one of the twelve and one of the biggest laboratories in the Institute of Nuclear Sciences - Vinča, founded in 1957. In the Laboratory there are permanent 51 employees. 39 of them are researchers with diploma: mechanical engineers, chemical engineers, electrical engineers, physicists and chemists. High scientific level of the Laboratory is ensured with: 23 PhD. holders, 6 M. Sc. Holders, 10 researcher scientists with diploma (B.Sc.) and 9 technicians. MAIN SCIENTIFIC FIELDS of the Laboratory for Thermal Engineering and Energy are: heat and mass transfer, turbulent flow, solid fuel/biomass combustion, energy efficiency in buildings, sustainable development, renewable energy sources (biomass, solar energy, wind), boiling and two-phase flow, high temperature processes (plasma) in multy-component and multy-phase systems, plasma assisted combustion of solid fuels, metrology of thermo physical properties, etc. Infrastructures experimental facilities include: Fluidized bed technology 1. Fluidized bed reactor for investigation of limestone efficiency (D=40mm) 2. Bench scale fluidized bed reactor (D=80mm), for combustion and pyrolysis kinetics 3. Small fluidized bed reactor for investigations of sintering (D=120mm) 4. Fluidized bed furnace (D=150mm) 5. Fluidized bed furnace for incineration of liquid wastes (D=250mm) 6. Pilot fluidized bed furnace (300x300mm, 250 kW) 7. Circulating fluidized bed cold facility (riser 80 mm in diameter and 7m height) Pulverized coal technology 1. Horizontal pulverized coal furnace with swirl burners (200kW); 2. Vertical pulverized coal furnace (70mm in diameter and 4m height); 3. Pulverized coal gasifier (150mm in diameter and 2.5m height) 4. A few prototypes of pulverized coal swirl burners (axial, tangential, with blocks) in the range of power 50 to 200 kW. Drying 1. Spray drier; 2. Fluidized bed and vibrating fluidized bed drier. Plasma technology 1. Plasma installation with power level of 10 kW for swirl coal burners ignition; 2. Plasma installation of 150 kW for synthesis ultrafine ceramic (SiC, Si3N4) powders; 3. Rotating plasma furnace (100 kW) for fusing oxide ceramic materials; 4. Air plasma installation (150 kW) for experimental investigation of plasma ignition and gasification of pulverized coal in axial burners.

Relevant publications:

CHINESE INSTITUTION:

Institution:
Nanjing University of Science and Technology

Address:
200 Xiao Ling Wei, Nanjing, Jiangsu, China, 210014

Phone:
+862584315114

Учешће на међународном пројекту

ИНСТИТУТ ЗА НУКЛЕАРНЕ НАУКЕ
"ВИНЧА"
Бр. 402-3/2020-140
22. 1. 2020 год
11001БЕОГРАД, П.п.522
Тел.(011) 3408101

CONTRACT

for Consulting Services

dated

between

Electric Power Industry of Serbia

– hereinafter referred to as the "Employer" –

represented by

KfW
Palmengartenstraße 5 – 9
60325 Frankfurt am Main Germany

– hereinafter referred to as "KfW" –

and

VINCA - Institute for Nuclear Science

– hereinafter referred to as the "Consultant" –

for

CONSULTING SERVICES RELATED TO THE MEASUREMENT AND TESTING OF THE ASH IN THERMAL POWER PLANT KOSTOLAC A

– hereinafter referred to as the "Project" –

BMZ no. 200465898

KfW order no.104903

Ad 8.1: **Arbitration Procedure**

The place of arbitration shall be Frankfurt am Main, Federal Republic of Germany.

The language of arbitration shall be English.

Frankfurt am Main, 06 January 2020

Kathrin Prasse
(for the Employer)

Xueying Valerie Wang
(for the Employer)

(place, date) BELGRADE, 22.01.2020

(for the Consultant)

(for the Consultant)

Annex 2

	Name of second expert	Milić Erić	KfW Order number	104903

Annex 2 [B-Offer Sheet Expert 2]

No.	Budget item	Country/unit	Number	Rates	Amount in EUR
1.0	**Fee**				
1.1	Remunerated days				
1.1.1	Country of deployment 1	[please select]			0,00
1.1.2	Country of deployment 2	[please select]			0,00
1.1.3	Country of deployment 3	[please select]			0,00
1.2	Remunerated days in the country of residence	Serbia	29,00	250,00	7.250,00
Subtotal					**7.250,00**
2.0	**Travel costs**				
2.1.	Daily allowances				
2.1.1	Country of deployment for 1.1.1	[please select]	0,00	0,00	0,00
2.1.2	Country of deployment for 1.1.2	[please select]	0,00	0,00	0,00
2.1.3	Country of deployment for 1.1.3	[please select]	0,00	0,00	0,00
2.2	Daily allowances in the country of residence (see 1.2)	Serbia	4,00	20,00	80,00
2.3	Accomodation				
2.3.1	Country of deployment for 1.1.1	[please select]	0,00	0,00	0,00
2.3.2	Country of deployment for 1.1.2	[please select]	0,00	0,00	0,00
2.3.3	Country of deployment for 1.1.3	[please select]	0,00	0,00	0,00
2.4	Accommodation in country of residence (see 1.2)	Serbia	4,00	74,00	296,00
2.5	Transport costs abroad				0,00
2.6	Transport costs in the country of residence		1.200,00	0,30	360,00
Subtotal					**736,00**
3.0	**Additional expenses**				
3.1	General supplement of 40% on the daily allowance		1,00	32,00	32,00
Subtotal					**32,00**

РЕЦЕНЗИЈЕ МЕЂУНАРОДНИХ РАДОВА;

Thermal Science

Publisher: Institute of Nuclear Sciences Vinca,
P.O. Box 522, 11001 Belgrade, Serbia
Tel. 381 (11) 2455 663, Fax 381 (11) 2453 670, E-mail: okasn@rcub.bg.ac.rs

Founder: The Society of Thermal Engineers of Serbia,
P.O. Box 522, 11001 Belgrade, Serbia

To:
Dr. Milić Erić
Laboratory for Thermal Engineering and Energy
VINCA Institute of Nuclear Sciences
University of Belgrade
Belgrade, Serbia
E-mail: milic@vin.bg.ac.rs

December 13th, 2017, Belgrade

Dear *Dr. Milić Erić*,

In the name of Editorial Board of the journal Thermal Science, I thank you for reviewing the paper:

Quantitative assessment of the improvement of the drying process by increasing the turbulence level

Author(s): José Luis Carrera-Escobedo, César Humberto Guzman-Valdivia, Arquímedes Ortiz-Rivera, Mario Alberto Garcia-Ruiz and Oscar Cruz-Domínguez

submitted for publication in Thermal Science.

Your review contributed to the high quality of the papers published in our journal.

I would appreciate if you, in the future, would be able to accept again to be our reviewer. Thanking you for your effort on behalf of the Journal.

Yours sincerely,

Dr. Vukman Bakić
Editor-in-Chief

Thermal Science

Publisher: Institute of Nuclear Sciences Vinca,
P.O. Box 522, 11001 Belgrade, Serbia
Tel. 381 (11) 2455 663, Fax 381 (11) 2453 670, E-mail: okasn@rcub.bg.ac.rs

Founder: The Society of Thermal Engineers of Serbia,
P.O. Box 522, 11001 Belgrade, Serbia

To:
Dr. Milić Erić
Laboratory for Thermal Engineering and Energy
VINCA Institute of Nuclear Sciences
University of Belgrade
Belgrade, Serbia
E-mail: milic@vin.bg.ac.rs

April 23th, 2020, Belgrade

Dear *Dr. Milić Erić*,

In the name of Editorial Board of the journal Thermal Science, I thank you for reviewing the paper:

Experimental evaluation of proposed multi-layered structure fire test methodology

Author(s): ***Remigijus Guobys and Vadim Mokšin***

submitted for publication in Thermal Science.

Your review contributed to the high quality of the papers published in our journal.

I would appreciate if you, in the future, would be able to accept again to be our reviewer. Thanking you for your effort on behalf of the Journal.

Yours sincerely,

Dr. Vukman Bakić
Editor-in-Chief

Thermal Science

Publisher: Institute of Nuclear Sciences Vinca,
P.O. Box 522, 11001 Belgrade, Serbia
Tel. 381 (11) 2455 663, Fax 381 (11) 2453 670, E-mail: okasn@rcub.bg.ac.rs

Founder: The Society of Thermal Engineers of Serbia,
P.O. Box 522, 11001 Belgrade, Serbia

To:
Dr. Milić Erić
Laboratory for Thermal Engineering and Energy
VINCA Institute of Nuclear Sciences
University of Belgrade
Belgrade, Serbia
E-mail: milic@vin.bg.ac.rs

March 20th, 2020, Belgrade

Dear *Dr. Milić Erić*,

In the name of Editorial Board of the journal Thermal Science, I thank you for reviewing the paper:

Study of vacuum and freeze drying of bee honey

Author(s): Nebojša Nedić, Milan Gojak, Ivan Zlatanović, Nedžad Rudonja, Kristina Lazarević, Milan Dražić, Kosta Gligorević, Miloš Pajić

submitted for publication in Thermal Science.

Your review contributed to the high quality of the papers published in our journal.

I would appreciate if you, in the future, would be able to accept again to be our reviewer. Thanking you for your effort on behalf of the Journal.

Yours sincerely,

Dr. Vukman Bakić
Editor-in-Chief

Thermal Science

Publisher: Institute of Nuclear Sciences Vinca,
P.O. Box 522, 11001 Belgrade, Serbia
Tel. 381 (11) 2455 663, Fax 381 (11) 2453 670, E-mail: okasn@rcub.bg.ac.rs

Founder: The Society of Thermal Engineers of Serbia,
P.O. Box 522, 11001 Belgrade, Serbia

To:
Dr. Milić Erić
Laboratory for Thermal Engineering and Energy
VINCA Institute of Nuclear Sciences
University of Belgrade
Belgrade, Serbia
E-mail: milic@vin.bg.ac.rs

September 6th, 2021, Belgrade

Dear *Dr. Milić Erić*,

In the name of Editorial Board of the journal Thermal Science, I thank you for reviewing the paper:

Impact of replacement selections and arrangement on geothermal aided power generation plants

Author(s): Ying Zhou, Jiyun Qin and Eric Hu

submitted for publication in Thermal Science.

Your review contributed to the high quality of the papers published in our journal.

I would appreciate if you, in the future, would be able to accept again to be our reviewer. Thanking you for your effort on behalf of the Journal.

Yours sincerely,

Dr. Vukman Bakić
Editor-in-Chief

SimTerm.4E

18th International Conference on Thermal Science and Engineering of Serbia

We are honored to confirm that dr. Milić ERIĆ, Vinca Institute, University of Belgrade evaluated paper **IMPLEMENTATION OF THE PRIMARY MEASURES FOR NOX REDUCTION IN TPP BITOLA AND ANALYZE OF THE CHANGES, Author: Lidija Joleska Bureska, for 18th International Conference on Thermal Science and Engineering of Serbia SIMTERM 2017.** The Simterm conference is organized in cooperation with the journal Thermal Science.

Prof. Mirjana Laković-Paunović, PhD
President of the Organizing Committee

Prof. Mirjana Laković-Paunović, PhD
University of Niš, Faculty of Mechanical Engineering Niš,
Department of Thermal Engineering
A : Aleksand ra Medvedeva 14, 18000 Niš-Crveni Krst, Serbia
W : simterm@masfak.ni.ac.rs, http://simterm.masfak.ni.ac.rs/
P : +381 18 500 646; Fax: +381-18-588-199; +381-18-588-244

ТЕХНИЧКА РЕШЕЊА

МИНИСТАРСТВО ПРОСВЕТЕ,
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА
Матични научни одбор за енергетику, рударство и енергетску ефикасност
ТР0304-033/2022
Београд, 29. јун 2022. год.

На основу захтева које је упутило научно веће Института за нуклеарне науке Винча за верификацију техничког решења реализованог у 2020. години, чланови Матичног научног одбора за енергетику, рударство и енергетску ефикасност су на седници одржаној 29. јун 2022. године, разматрали предлог и гласањем утврдили да су у складу са условима које предвиђа Правилник о поступку и начину вредновања и квантитативном исказивању научноистраживачких резултата истраживача („Службени гласник РС“, број 24/2016, 21/2017 и 38/2017) успуњени сви прописани услови за признавање категорија **М82 „Ново техничко решење (метода) примењено на националном нивоу“** за техничко решење под називом **Нова методологија за одређивање масеног протока летећег пепела по електричним пољима електрофилтерских постројења** чији су аутори *Милић Ерић, Зоран Марковић, Предраг Стефановић, Иван Лазовић, Расшко Јовановић и Александар Милићевић.*

Матични научни одбор
за енергетику, рударство и енергетску
ефикасност
Председник
Проф. др Милош Бањац

Министарство просвете, науке и технолошког развоја
Матични научни одбор за енергетику, рударство
и енергетску ефикасност

Београд, 30. септембар 2019. год.

Поштовани,

На основу захтева за верификацију техничког решења под називом

„Унапређено електрофилтерско постројење на блоку А4 ТЕ "Никола Тесла А" "

чији су аутори

Илија Стевановић, Младен Остојић, Сава Добричић, Дарко Јевтић, Предраг Стефановић, Зоран Марковић, Милић Ерић, Дејан Цветиновић

чланови Матичног научног одбора за за енергетику, рударство и енергетску ефикасност су на својој седници одржаној 30. септембра 2019. године, разматрали исти и донели одлуку да су у складу са условима које предвиђа Правилник о поступку и начину вредновања и квантитативном исказивању научноистраживачких резултата истраживача („Службени гласник РС", број 24/2016, 21/2017 и 38/2017):

ИСПУЊЕНИ СВИ ПРОПИСАНИ УСЛОВИ ЗА ДОДЕЛУ КАТЕГОРИЈЕ

М84 „Битно побољшано техничко решење, метод примењен у Републици Србији".

С поштовањем,

др Милош Недељковић

председник Матичног научног одбора
за енергетику, рударство
и енергетску ефикасност

МИНИСТАРСТВО ПРОСВЕТЕ,
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА
Матични научни одбор за енергетику,
рударство и енергетску ефикасност

Београд, 29. новембар 2019. год.

Поштовани,

На основу захтева за верификацију техничког решења под називом

Нова високотемпературска пећ у склопу лабораторијског уређаја за испитивање топивости пепела чврстих горива

чији су аутори

Милица Младеновић, Милијана Пајрика, Горан Живковић, Милић Ерић, Зоран Марковић

чланови Матичног научног одбора за за енергетику, рударство и енергетску ефикасност су на својој седници одржаној 29. новембра 2019. године, разматрали исти и донели одлуку да су у складу са условима које предвиђа Правилник о поступку и начину вредновања и квантитативном исказивању научноистраживачких резултата истраживача („Службени гласник РС“, број 24/2016, 21/2017 и 38/2017):

ИСПУЊЕНИ СВИ ПРОПИСАНИ УСЛОВИ ЗА ДОДЕЛУ КАТЕГОРИЈЕ

М84 „Битно побољшано техничко решење, метод примењен у Републици Србији“.

С поштовањем,

др Милош Недељковић

председник Матичног научног одбора
за енергетику, рударство
и енергетску ефикасност

МИНИСТАРСТВО ПРОСВЕТЕ,
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА
Матични научни одбор за енергетику, рударство и енергетску ефикасност
ТР0302-033/2022
Београд, 30. март 2022. год.

На основу захтева које је упутило научно веће Института за нуклеарне науке Винча за верификацију техничког решења реализованог у 2021. години, чланови Матичног научног одбора за енергетику, рударство и енергетску ефикасност су на седници одржаној 30. март 2022. године, разматрали предлог и гласањем утврдили да су у складу са условима које предвиђа Правилник о поступку и начину вредновања и квантитативном исказивању научноистраживачких резултата истраживача („Службени гласник РС“, број 24/2016, 21/2017 и 38/2017) успуњени сви прописани услови за признавање категорија **М85 „Ново техничко решење у фази реализације“** за техничко решење под називом **Унапређена апаратура за сушење нискоквалитетних угљева до равнотежне влажности у непокретном и флуидизиваном слоју** чији су аутори *Милић Ерић, Зоран Марковић, Иван Лазовић, Растко Јовановић, Милица Младеновић.*

Матични научни одбор
за енергетику, рударство и енергетску ефикасност
Председник
Проф. др Милош Бањац

ЧЛАНСТВО У ОРГАНИЗАЦИОНОМ ОДБОРУ МЕЂУНАРОДНИХ КОНФЕРЕНЦИЈА

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PROCEEDINGS

20th International Conference on

Thermal Science and Engineering of Serbia
October 18 – 21, 2022
Niš, Serbia

The University of Niš, Faculty of Mechanical Engineering,
Department of Thermal Engineering and
Society of Thermal Engineers of Serbia

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2022

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ЧЛАНСТВО У КОМИСИЈИ ЗА СТАНДАРДЕ И СРОДНЕ ДОКУМЕНТЕ KS H146, КВАЛИТЕТ ВАЗДУХА, ИНСТИТУТА ЗА СТАНДАРДИЗАЦИЈУ СРБИЈе

РЕПУБЛИКА СРБИЈА
ИНСТИТУТ ЗА СТАНДАРДИЗАЦИЈУ СРБИЈЕ
Број 41/9-22-04/2022
Београд, 17.11.2022 године

ИНСТИТУТ ЗА СТАНДАРДИЗАЦИЈУ СРБИЈЕ

На основу члана 67. став 1. тачка 28) Статута Института за стандардизацију Србије („Службени гласник РС", бр. 29/2017) и Интерних правила стандардизације – Део 2: Образовање и рад комисија за стандарде и сродне документе, ИПС 2:2021, директор Института за стандардизацију Србије доноси

РЕШЕЊЕ
о измени и допуни Решења о образовању комисије за стандарде и сродне документе

1. У решењу о образовању комисије за стандарде и сродне документе **KS H146**, *Квалитет ваздуха*, (у даљем тексту: Комисија за стандарде) бр. 649/4-27-01/2013 од 08.04.2013. године и решења о његовим изменама и допунама бр. 524/9-22-04/2017 од 28.03.2017. године, разрешава се дужности председник Комисије за стандарде:

1) мр Михајло Гигов, дипл. физичко-хем., Рударски институт д.о.о., Београд, 11080 Земун, Батајнички пут 2, e-mail: mihajlo.gigov@ribeograd.as.rs, телефон: +381 11 2615 796; +381 11 2619 033.

2. Разрешавају се дужности следећи чланови Комисије за стандарде:

1) др Дејан Ђуровић, научни сарадник, Институт за нуклеарне науке Винча, Лабораторија за термотехнику и енергетику ЛТЕ, 11351 Београд-Винча, Михајла Петровића Аласа бр.12-14, e-mail: dejan2004@vinca.rs, телефон: +381 11 3408 837;

2) Данијела Симоновић, дипл. инж. технологије, АТС, 11000 Београд, Влајковићева 3, e-mail: danijela.simonovic@ats.rs, телефон: +381 11 313 0373; +381 69 135 6303;

3) мр Душица Радојичић, биолошке науке, Министарство енергетике, развоја и заштите животне средине, 11070 Нови Београд, Омладинских бригада 1, e-mail: dusica.radojicic@merz.gov.rs, телефон: +381 11 2856 145;

4) Сања Радић–Кукић, дипл. инж. техн., „ХИП–Азотара" Панчево, 26000 Панчево, Спољностарчевачка 80, e-mail: sanja.radic@hip-azotara.co.rs, телефон: +381 13 308 156;

5) Милијана Ђукановић, дипл. инж. техн., Институт за јавно здравља Србије „др Милан Јовановић - Батут", 11000 Београд, др Суботића 5, e-mail: ekt2@batut.org.rs, телефон: +381 11 2684 566/151;

6) Беата Немет Габриел, дипл. инж. техн., Завод за јавно здравље Суботица, 24000 Суботица, Змај Јовина 30, e-mail: gabriel.beata@gmail.com, телефон: +381 24 571 189;

Стевана Бракуса бр. 2, 11030 Београд
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Телефакс: (011) 75-41-257
Матични број: 17740580
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Е-пошта: infocentar@iss.rs

Продаја: (011) 65-47-496
Е-пошта: prodaja@iss.rs
Веб-сајт: www.iss.rs

3. Именују се нови чланови Комисије за стандарде:

1) др Михајло Гигов, доктор физичкохемијских наука, AMG Chemtech Solutions д.о.о., 11000 Београд, Интернационалних бригада 83, е-пошта: mihajlo.gigov@amgchemtech.rs, телефон: +381 64 1163524;

2) мастер Марија Живковић, дипл. хемичар, Институт за нуклеарне науке Винча, Институт од националног значаја за Републику Србију (број запослених 800), 11351 Винча, Мике Петровића Аласа 12-14, е-пошта: marijaz@vinca.rs, телефон: +381 63 1138305;

3) др Дуња Соколовић, ванредни професор, Факултет техничких наука (високо образовање) 21000 Нови Сад, Трг Доситеја Обрадовића 6, е-пошта: dunjaso@uns.ac.rs, телефон: +381 21 450810; +381 63 8167939;

4) др Наташа Драгић, доцент, Институт за јавно здравље Војводине, (јавно здравље), 21000 Нови Сад, Футошка 121, е-пошта: natasa.dragic@izjzv.org.rs, телефон: +381 21 4897800, +381 214897823;

5) др Милена Јовашевић-Стојановић, научни саветник, Институт за нуклеарне науке Винча, 11351 Винча, Мике Петровић Аласа 12-14, е-пошта: mjovst@vinca.rs, телефон: +381 11 3408104, +381 11 3408695 и

6) др Андреј Шоштарић, Градски завод за јавно здравље Београд, (остала здравствена заштита), 11000 Београд, Булевар деспота Стефана 54а, е-пошта: andrej.sostaric@zdravlje.org.rs, телефон: +381 11 2078600. +381 11 2078791, +381 62 8099026.

4. После измена и допуна из тачака 1., 2 и 3. овог решења, пречишћен текст тачке 7. Решења о образовању комисије за стандарде, која се односи на састав комисије гласи:

-председник:

1) др Михајло Гигов, доктор физичкохемијских наука, AMG Chemtech Solutions д.о.о., 11000 Београд, Интернационалних бригада 83, е-пошта: mihajlo.gigov@amgchemtech.rs, телефон: +381 64 1163524;

- чланови:

2) др Мирослав Кузмановић, Факултет за физичку хемију, 11000 Београд, Студенски трг 12-16, е-пошта: miroslav@ffh.bg.ac.rs; телефон:

3) др Јелена Бебић, дипл. инж. техн., Дирекција за мере и драгоцене метале, 11000 Београд, Мике Аласа 14, е-пошта: jelenabebic@dmdm.rs, телефон: +381 11 2024 427;

4) Младен Милић, дипл. инж. техн., Институт за јавно здравља Србије, „др Милан Јовановић - Батут“, 11000 Београд, др Суботића 5, е-пошта: ekt2@batut.org.rs, телефон: +381 11 2684 566/151;

5) мр Рената Ковачевић, дипл. инж. хем., Институт за рударство и металургију Бор, 19210 Бор, Зелени булевар 35, е-пошта: renata.kovacevic@irmbor.co.rs, телефон: +381 30 454 141, +381 30 454 138;

6) Татјана Апостоловски Трујић, дипл. инж. мет., Институт за рударство и металургију Бор, 19210 Бор, Зелени булевар 35, е-пошта: tatjana.trujic@irmbor.co.rs, телефон: +381 30 454 152;

7) Наташа Црнковић, дипл. инж. техн., Агенција за заштиту животне средине, 11060 Београд, Немањина 22-26, е-пошта: natasa.crnkovic@sepa.gov.rs, телефон: +381 2861 080 лок. 210;

8) Властo Стеванетић, дипл. инж. технолог, специјалиста санитарне хемије, Завод за јавно здравље Ужице, 31000 Ужице, Веселина Маринковића бр.4., e-mail: vlasto.stevanetic@hotmail.rs, vlasto.stevanetic@zavodue.org.rs, телефон: +381 31 510 214; +381 63 8035 856;

9) др Милић Ерић, научни сарадник, Институт за нуклеарне науке „Винча", 11351 Винча-Београд, Мике Петровића Аласа 12-14, e-mail: milic@vinca.rs, телефон: +381 11 3408 343; +381 64 198 66 43;

10) Далибор Калајџић, маст. инж. заштт. жив. средине, Завод за јавно здравље Чачак, 32000 Чачак, Веселина Миликића бр. 7, e-mail: emisija@zdravljecacak.org, телефон: +381 32 225 019; +381 64 863 8819;

11) Мирослав Мијатовић, дипл. физ. хемичар, Аеролаб д.о.о., 11080 Земун, Железничка 16, e-mail. miroslav.mijatovic@aerolab.rs, телефон: +381 11 3750 850; +381 63 330 004;

12) мастер Марија Живковић, дипл. хемичар, Институт за нуклеарне науке Винча, Институт од националног значаја за Републику Србију (број запослених 800), 11351 Винча, Мике Петровића Аласа 12-14, е-пошта: marijaz@vinca.rs, телефон: +381 63 1138305;

13) др Дуња Соколовић, ванредни професор, Факултет техничких наука (високо образовање) 21000 Нови Сад, Трг Доситеја Обрадовића 6, е-пошта: dunjaso@uns.ac.rs, телефон: +381 21 450810; +381 63 8167939;

14) др Наташа Драгић, доцент, Институт за јавно здравље Војводине, (јавно здравље), 21000 Нови Сад, Футошка 121, е-пошта: natasa.dragic@izjzv.org.rs, телефон: +381 21 4897800, +381 214897823;

15) др Милена Јовашевић-Стојановић, научни саветник, Институт за нуклеарне науке Винча, 11351 Винча, Мике Петровић Аласа 12-14, е-пошта: mjovst@vinca.rs, телефон: +381 11 3408104, +381 11 3408695 и

16) др Андреј Шоштарић, Градски завод за јавно здравље Београд, (остала здравствена заштита), 11000 Београд, Булевар деспота Стефана 54а, е-пошта: andrej.sostaric@zdravlje.org.rs, телефон: +381 11 2078600. +381 11 2078791, +381 62 8099026 и

секретар:
Марина Донић, дипл.инж.тех., Институт за стандардизацију Србије, 11030 Београд, Стевана Бракуса 2, e-mail: marina.donic@iss.rs, телефон: +381 11 3409 3638.

5. Све одредбе Решења о образовању комисије за стандарде бр. 649/4-27-01/2013 од 08.04.2013. године и решења о његовим изменама и допунама бр. 524/9-22-04/2017 од 28.03.2017. године, које нису обухваћене овим решењем, остају и даље на снази.

6. Решење ступа на снагу даном доношења.

7. Приговор не одлаже извршење решења.

Образложење

На седници Комисије за стандарде KS H146, одржане дана 04.08.2022. године, у Институту за стандардизацију Србије, преиспитано је чланство према Решењу о образовању комисије за стандарде и сродне документе и закључено да је председник комисије, др Михајло Гигов, променио организацију и доставио попуњену пријаву за представника AMG Chemtech Solutions д.о.о.

У складу са тачком 5.6. Интерних правила стандардизације – Део 2: Образовање и рад комисија за стандарде и сродне документе, ИПС 2:2021, престаје чланство у комисији др Дејану Ђуровићу, представнику Институт за нуклеарне науке Винча, Лабораторија за термотехнику и енергетику ЛТЕ, Данијели Симоновић, представнику АТС; мр Душици Радојичић, представнику Министарства енергетике, развоја и заштите животне средине; Сањи Радић–Кукић, представнику „ХИП–Азотара" Панчево; Милијани Ђукановић, представнику Институт за јавно здравља Србије „др Милан Јовановић - Батут" и Беата Немет Габриел, представнику Завода за јавно здравље Суботица, због неоправданог одсуствовања са три и више седница комисије, односно због неучествовања у три узастопна изјашњавања путем преписке.

На истој седници размотрене су и прихваћене пријаве за нове чланове комисије за стандарде Марије Живковић, представника Институт за нуклеарне науке Винча, др Дуње Соколовић, представника Факултет техничких наука и др Наташе Драгић, предстравника Институт за јавно здравље Војводине, др Милене Јовашевић-Стојановић, представника Института за нуклеарне науке Винча и др Андреја Шоштарића, представника Градског завода за јавно здравље Београд.

У складу са чланом 67. став 1. тачка 28) Статута Института за стандардизацију Србије и Интерним правилима стандардизације – Део 2: Образовање и рад комисија за стандарде и сродне документе, ИПС 2:2021, директор Института је донео решење као у диспозитиву.

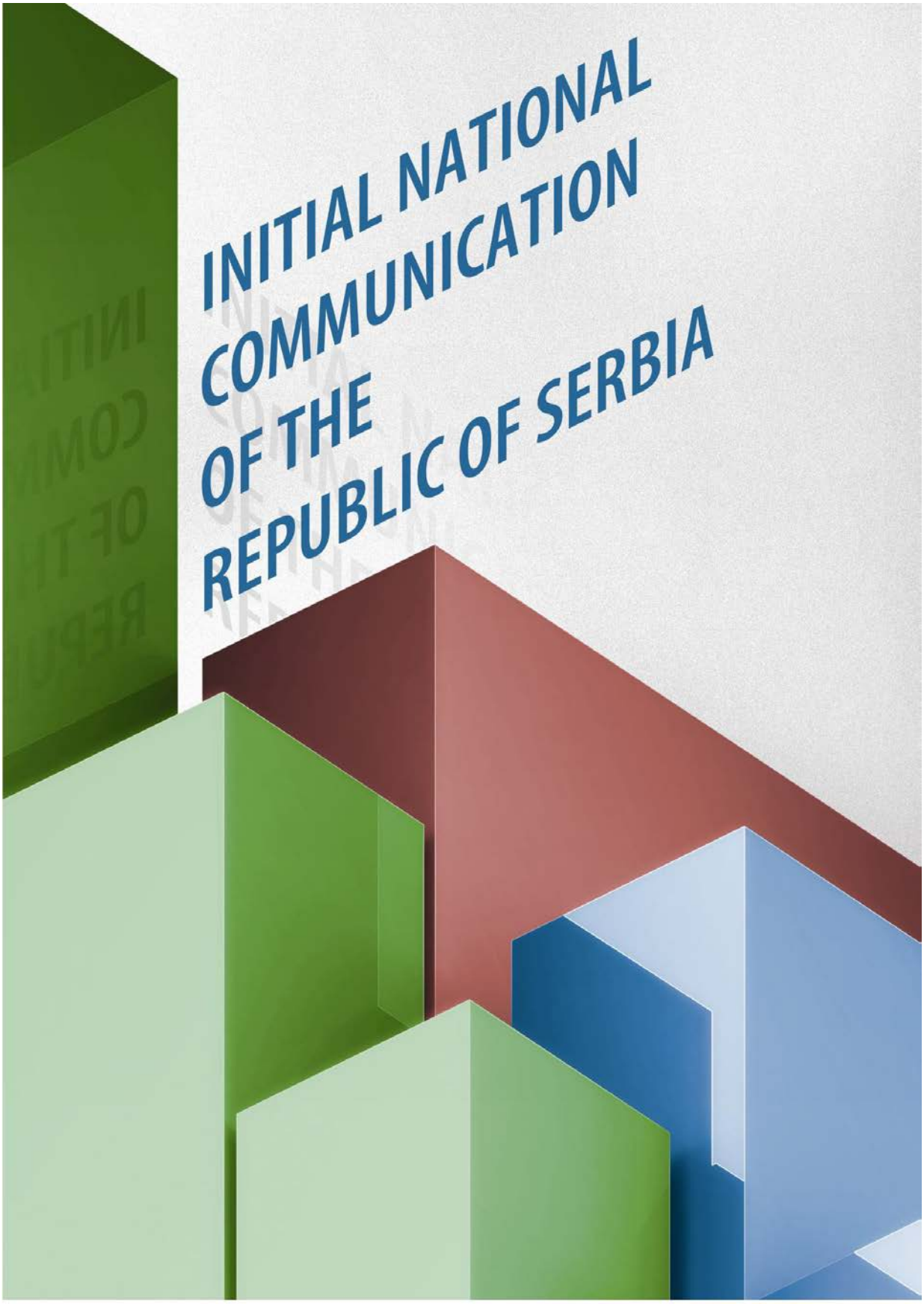
УПУТСТВО О ПРАВНОМ СРЕДСТВУ: Против овог решења именовани имају право приговора доносиоцу решења у року од осам дана од пријема решења.

ДИРЕКТОР

ТАТЈАНА БОЈАНИЋ

Доставити:
- Председнику, члановима и секретару Комисије за стандарде
- Стручном савету за опште области стандардизације,
- Одељењу за међународну сарадњу, информисање и пружање стручне помоћи
- Одељењу за правне, финансијске и опште послове.

ПРВА НАЦИОНАЛНА КОМУНИКАЦИЈА ЗА РЕПУБЛИКУ СРБИЈУ ПРЕМА ОКВИРНОЈ КОНВЕНЦИЈИ УЈЕДИЊЕНИХ НАЦИЈА О КЛИМАТСКИМ ПРОМЕНАМА



INITIAL NATIONAL COMMUNICATION OF THE REPUBLIC OF SERBIA UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

Belgrade, November 2010

Initial National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change

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ПОЗИВНО ПИСМО

April, 2019

dr Milić Erić
University of Belgrade
Vinča Institute of Nuclear Science

Dear dr.Erić ,

We are pleased to invite you to the "19th International Conference on Thermal Science and Engineering of Serbia – SIMTERM 2019", scheduled from 22-27 October 2019 in Sokobanja, Serbia. This Conference will be a joint effort of the University of Niš, Faculty of Mechanical Engineering and the Society of Thermal Engineers of Serbia, with support of the Ministry of education, science and technological development of Serbia, Ministry of Mining and Energy of Serbia and City of Niš.

The representatives of Ministries, University and City government, will inaugurate the Conference. The Director of Energy Agency is expected to address the Opening Ceremony.

The Symposium deliberations will be on the following themes:

- **Energy sources and potentials**
- **Technologies and plants**
- **New and renewable energy sources**
- **Energy efficiency in industry, civil engineering, communal systems and traffic**
- **Flow, heat and mass transfer, combustion**
- **Testing of operating plants**
- **Experimental investigation of processes**
- **Mathematical modeling and numerical simulation**
- **Environmental protection**
- **Reliability of processes, equipment, and plants**
- **Automatics and control of processes**
- **Water, air and soil quality management**
- **Energy management (in industry and buildings)**

It is an honor and privilege to invite you to participate in this Symposium as **Invited Speaker,** with the theme of your interest. We believe that your contribution is unparalleled and will be of great benefit.

Accommodation expenses will be borne by the organizer of the Symposium.

We look forward to a positive confirmation, an honor for us indeed.

Your Faithfully,

President of Organizing Program committee
dr Mladen Stojiljković

President of Organizing committee
dr Mirjana Laković-Paunović

University of Niš, Faculty of Mechanical Engineering, Niš, Serbia

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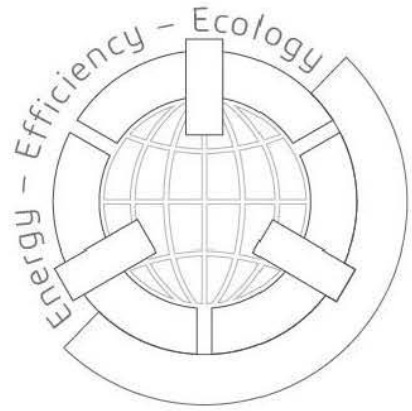

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Contents

Development of Pre-drying Procedures of Low-rank Coals to Increase Efficiency of Coal Fired Power Plant

Milić D. Erić[a] (CA), Zoran J. Marković[b], Predrag Stefanović[c], Rastko D. Jovanović[d], Nikola Živković[e]

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Abstract: Carbon dioxide participates in the total greenhouse gasses emissions by around 75%. Majority of carbon dioxide emitted to the atmosphere comes from power plants burning coal. It is expected that coal will remain the dominant energy source due to its large reserves, world-wide availability, and stable and relatively low price in the international market. Thus, one of the biggest challenges is development of low carbon dioxide technologies for coal utilization. Clean coal technologies are group of measures aiming to reduce carbon dioxide emissions by increasing energy efficiency of coal power plants. Special attention is given to low quality coals with high moisture content, among which lignite coals have dominate position. One of the most promising technologies for increasing the rank from lignite coals is coal pre-drying using thermal energy from the power plant. This work aims to present the major advances in development and state-of-art utilization of coal pre-drying technology. Examples of the pre-drying technology advancements are given for all countries in which this technology is under major development, including: US, EU, Japan, Canada, and Australia. Special attention is given to the experimental and numerical results of investigation of coal pre-drying process of Serbian Kolubara lignite coals.

Keywords: Energy efficiency, Fluidized bed, Low-rank coals, Pre-drying procedures

1. Introduction

Low-rank high-moisture coals around the world are vast constitute and a major energy source for the future as reserves of such. High moisture content entails high transportation costs, potential safety hazards in transportation and storage. In the combustion of such coals the thermal efficiency is reduced and increased CO_2 emissions that contribute to the greenhouse effect. This is because in conventional coal-fired power plants a part of the fuel's heat is consumed in the boiler during combustion and mill drying to evaporate coal moisture. The coal moisture leaves the power plant as steam together with the flue gas, so that this heat cannot be used in the plant process and is lost. Also, the presence of moisture in coal reduces coal friability, negatively affecting the quality of grinding, as well as pneumatic transport of pulverized coal.

US low-rank coals have typical values of moisture content range in the range 15-30% for sub-bituminous coal and 25-40% for lignite [1]. The ash content of American lignite varies depending on the moisture content, *e.g.* ash content of lignite (North Dakota) with 40% moisture is 12% [1]. In the work of Levi and others [2] it was stated that the coal-drying experiments in the fluidized bed were carried out with coals of the following moisture content: about 37% for sub-bituminous coal (Power River Basin) and 54-58% for lignite (North Dakota).

The moisture content of German low-quality coal exceeds 50%, while the ash content is 5-15%, depending on the moisture content [3]. Open pits of lignites, *i.e.* brown coals are: Rhineland, Lusatian, Central German and Helmstedt.

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Results of the Reconstruction and Modernization of theElectrostatic Precipitators at Unit B1of the TPP Kostolac B

MilićErić[a] (CA), PredragStefanović[a], ZoranMarković[a],VukSpasojević[a], Ivan Lazović[a],DraganŽivić[b], ŽeljkoIlić[b]

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Abstract: China Machinery Engineering Corporation (CMEC) has performed the rehabilitation and modernization of Electrostatic Precipitator System (ESP) of the unit B1 of Thermal Power Plant Kostolac B (TEKO B1) in 2014, according the items of the Main Contract of Phase I of Kostolac-B Package Project. The Performance– Control Test performed at the beginning of the exploitation period of the upgraded ESP proved that, under normal and guarantee working conditions of the boiler and ESP, the concentration of particulate matter in flue gases at the exit of upgraded ESP do not exceed value of 50 mg/Nm^3. After the control measurements and the period of ESP further testing and adjustments, the Laboratory for Thermal Engineering and Energy, Institute of Nuclear Sciences Vinča, performed five series of measurements in the frame of Acceptance Test in accordance with ISO 9096, EN 15259 and EN 13284-1 standards. This paper presents results of the investigationof particulate matter concentration, laboratory analysis of the coal samples, working parameters of the unit/upgraded ESP and results of the calculations. The averaged mean particulate concentration at the exit of Upgraded ESP of unit TEKO B1 during Acceptance Test was below guaranteed value.

Keywords:emission, electrostatic precipitator, particulate matter, reconstruction.

1. Introduction

An Electrostatic Precipitator (ESP) is one of the most efficient device to remove flying ashes from the flue gas in thermalpower plants, before passing the gas into the chimney.Maximumallowable value of dust concentration for the large power units (more than 50MW) is 50 mg/m^3[1]and it requires theefficiency of the ESPs better than 99%. Fulfilling this demand simultaneously calls for anincrease of active surface of the electrodes, improvement of flue gas distribution in order to obtain uniform flue gas distribution profile and to decrease the erosive effect of the dust particles, which together increase thevolume and the weight of the ESP, or evenapplication of high frequency high voltage power supply (HF HV)[2] instead of transformer and the dioderectifier (T/R) set.The performance of an ESP isusually determined by Voltage-Current (V-I) characteristics which will reflect upon the ESP collection efficiency and strongly depends on coal calorific value, content of ash in the coal and electrical resistivityof the ash, which depends of alkali and sulfur content in the ash [3] by influence on level of current when development of back corona event take place.Modernization and optimization of existing ESP TEKO B1 was a complex task assisted by the results of complex measurementsand laboratory determinations of different parameters before [4] and after [5] modernization. Although the application of modern numerical simulation methods is increasingly more frequent with the development of computing technologies, the results of Computational Fluid Dynamic (CFD) numerical simulationof the gas [6] or two-phase flow [7]in the ESP, or CFD modeling of diffusional flux of gas ions[8] and behavior ofcharged particles in turbulent gas flow in ESP [9] pointed up that numerical simulation of the fully coupled three coexisting fields of flue gas flow, ash particle dynamics and electrostatics in the ESP chamber is still very demanding task and how important a highly detailed geometry model is for a strong simulation and reliable results. The results of the numerical simulation supported by the results of the real scale measurements of the real velocity profile at the inlet boundary [10]was found to predict better the velocity distribution inside the ESP suggesting that an experimentally measured velocity profile could be used as velocity inlet boundary condition for an accurate numerical simulation of the ESP. The approach based on finite difference method has been utilized for the simulation of V-I characteristics of

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Results of the Temperature Variation in Experimental Researchof the Kolubara Lignite Drying Process in Packed Bed

Milić Erić (CA), Rastko Jovanović, Zoran Marković, Nikola Živković, Predrag Škobalj

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Abstract: Removal of moisture from low-rank coals is deemed an important quality upgrading method. Experimental research of convective drying of the Kolubara lignite was conducted. Drying process was investigated under the packed bed conditions. Experimental investigations of drying process in packed bed were performed at three different air temperatures, measured in the front of sample, for three different coal particle sizes, and for three different coal sample masses. The obtained experimental results and influence of the above mentioned parameters values variation showed that sample drying rate increased, while sample drying time decreased with temperature increase.

Keywords: convective drying, lignite, moisture, packed bed

1. Introduction

Kolubara and Kostolac open-pit mines lignite coal will continue to be the main energy source used in Serbian power plants, mainly due to the fact that it is the most abundant and cheapest fossil fuel available.Kolubara lignite is the mostly used coal in the Republic of Serbia. It belongs to low quality coals with moisture content in the range of 45 to 52%.The presence of moisture in coal reduces coal friability, negatively affecting the quality of grinding, as well as pneumatic transport of pulverized coal. Reduced moisture level in coal results in increased power plant efficiency, reduced ash disposal requirements and reduced pollutant emissions [1].

Nowadays there are several ways to reduce moisture content of low-rank coals. The methods used may be divided into two main groups: conventional evaporative drying (direct or indirect dryers, packed or fluid bed dryers, rotary kiln, etc.) and non-evaporative dewatering processes (mechanical thermal expression, hydro-thermal dewatering, etc.).

It is well known that conventional evaporative convective drying involves complex transport phenomena consisting of three consecutive processes. The first one is moisture (in liquid phase) movement in solids, occurring from the wet interior towards the gas-solid interface (internal pore, particle surface, etc.). This process is slower in larger solids and/or materials with low moisture content. The second one is evaporation facilitated by heat (energy) supplied either externally or taken from the solids and used to transform liquid into vapor. The last one is vapor movement to the surrounding gas by diffusion and convection. The slowest of the processes determines the overall drying rate. Prediction of falling-rate drying kinetics by theory alone is very difficult. Thus, accurate small-scale experiments are required instead. It is possible to estimate drying rates under different conditions by applying concepts such as the "characteristic drying curve" ([2-3], and others) or the "drying coefficient" ([4-5] etc.).

In the Vinca Institute of Nuclear Sciences, Laboratory for Thermal Engineering and Energy, a number of experiments were performed in the field of convective drying. The first step was drying in the packed bed.

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Regenerative Process Operating Parameters for Sulfur Dioxide Physical Absorption from Flue Gases

Nikola Živković[a] (CA), Mirjana Kijevčanin[b], Emila Živković[b], Predrag Stefanović[a], Vuk Spasojević[a] and Milić Erić[a]

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Abstract: The wet flue gas desulfurization (FGD) processes with organic liquid solvents, based on physical/chemical absorption mechanism, followed by solvent thermal regeneration, lately have gained wider application and significance. Unlike standard lime/limestone procedure, which is once-through process, in regenerative processes solvent is regenerated in desorber and reused later. A regenerative process consists of two separate sub-processes, absorption and desorption. Each one is taking place in separate unit. In this work, operating parameters for sub-processes, have been calculated separately. Input parameters for calculation of sulfur dioxide (SO_2) removal process, were flue gas composition, flow rate and temperature at utility boiler electrostatic precipitator. Tetraethylene glycol dimethyl ether (TEGDME) has been used as a liquid organic solvent. Based on the process calculation, the influence of solvent flow rate, flue gas temperature at absorber inlet, absorber operating pressure and the number of column trays, on SO_2 separation efficiency, have been presented. Solvent has been regenerated, with pure nitrogen at elevated temperature. The influence of molar flow rate and temperature of nitrogen and the number of column trays, on SO_2 separation efficiency from solvent, have been examined. The paper presents possibility for applying an alternative approach and technology for FGD on thermal power and industrial plants.

Keywords: Sulfur dioxide, Physical absorption, Flue gas, Thermal power plant.

1. Introduction

The adverse effects of SO_2 presence in the atmosphere to human population, biosphere and buildings, are well known [1, 2, 3]. SO_2 is emitted into the atmosphere from natural sources and industry. Industrial activities have a much greater impact on total SO_2 emissions, among which dominates the burning of fossil fuels that contain sulfur, such as coal and oil in power plants, steel mills and foundries. Taking into account its harmful effects on human health, the environment and climate change, the most of developed countries in the world, which are also the major emitters of greenhouse gases, including SO_2, developed a policy towards the protection of the environment and reduction of climate change on our planet. Policy and regulations for GHG emissions reduction, induced the need to improve existing technological processes in terms of efficiency, but also to develop new more efficient technologies for flue gas purification

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Evaluation of Kostolac Lignite Carbon Emission Characteristics

Vuk Spasojević[a] (CA), Predrag Stefanović[a], Nikola Živković[a], Ana Marinković-Radojević[a], Milić Erić[a] and Zoran Marković[a]

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Abstract: Present scientific investigations provide clear evidence that human activities have caused the significant concentration rise of greenhouse gases over the past 200 years. Climate shift changes have negative effect on human health, agriculture, weather and overall effect on global economy which results in serious environmental concearns derived from the need to reduce greenhouse gases emissions from industrial sector. Carbon dioxide as main contributor to overall greenhouse gases effect and its emissions from industrial waste gases have become a major target for reduction, especially flue gases from coal power plant stations as main emitters of carbon dioxide. Before any implementation of systems for reduction of carbon dioxide emissions, thorough and comprehensive characterization of local fossil fuels must be performed on national level which is also recomendation by guidelines of Intergovermental Panel on Climate Change. This paper provides modest contribution toward these efforts. Laboratory inestigation was performed on 20 samples of low-calorific lignite recovered from the Kostolac open-pit mine. The samples of coal were carefully selected in order to cover the broad spectrum of the quality of the raw lignite supplied to the Serbian thermal power plants. Main task of this paper was to investigate correlations regarding parameters which are of great concearn such as content of moisture, content of ash, content of combustible matter, upper and lower heating values and content of total carbon and hydrogen. Emission factor for Kostolac lignite coal and dependances on investigated parameters are presented within this paper. Received results show that linear dependencies of carbon emission factor with investigated parameters can be used with high level of confidence, thus providing reliable tool for prediction and control of carbon dioxide emissions originating from combustion process in thermal power plants.

Key words: greenhouse gases inventory, Kostolac lignite, carbon emission factor, fuel characterization, laboratory analysis

1. Introduction

Recent reports of the Intergovermental Panel of Climate change (IPCC) [1] predicts an increase of average global temperature ranging from 1.1 to 6.4 °C by the end of 21th century. Such high increase of temperature will cause irreversible negative impact on agriculture, food production, water supply, diversity of ecosystems but also more importantly on economic development and global stability. The Republic of Serbia as non-Annex I member of Kyoto Protocol[2] is currently in no obligation to reduce emissions of greenhouse gases. Nevertheless, as a candidate for the EU membership Republic of Serba has commited to the international co-operation in the field of climate research. The European Union member states have realised a series of mandatory documents, all aimed at reduction of greenhouse gases such as implementation of the Directive 2003/87/EC but also the implementation of European emission trading schema (ETS). Taking into account current level of industry development and current level of GHG emissions, it is becoming clear that Serbia will have to significantly improve its capacity for full implementation of energy-climate packages[3-6]. In past two years, first steps have been performed by the Ministry of agriculture and environmental protection. The ministry have categorized over 127 main industrial emitters of carbon dioxide from field of energy, heat production, cement, petro-chemical and steel industry sectors backed-up by concomitant legislation acts. All these subjects are in obligation to perform monitoring of carbon dioxide emissions starting from 2017. This is obligatory especially in energy sector since over 40% of overall carbon dioxide emissions originate from this sector[7]. Current legislation regarding carbon dioxide emission states that all companies which in their production process use equipment with installed thermal energy output over 20MW will be in obligation to monitor and report overall carbon dioxide emissions on annual bases.

Taking into account the composition of energy sector, over 70% of total energy generation and over 50% of primary energy consumption comes from combustion of low-calorific coal-pit mine lignite which is the main

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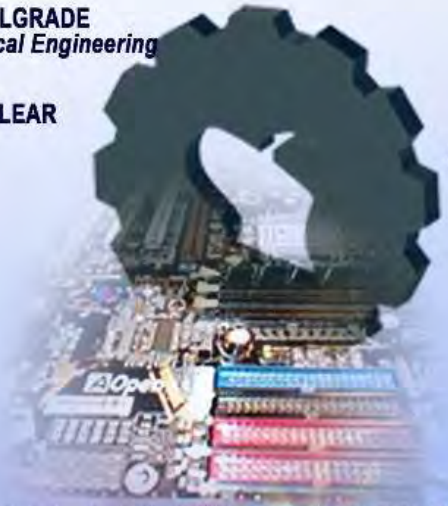

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EXPERIMENTAL RESEARCH OF THE INFLUENCE OF DRYING MEDIUM HUMIDITY IN CONVECTIVE DRYING OF PEAS IN A STAGNANT BED

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Abstract. *The results obtained during the green peas convective drying in a stagnant bed are presented in this paper. The aim of this investigation is to determine influence of drying medium humidity on drying time. Comparison is made in several experiments with different drying regimes with surrounding air and dry nitrogen as a drying medium. Obtained results show very similar results and there is no reason to use dry medium instead surrounding humid air.*

Key words: *Convective drying, Stagnant bed, Peas, Humidity.*

1. INTRODUCTION

Solid drying is a common process in food, pharmaceutical and chemical industry applications and other (material for civil engineering, wood, tobacco…). The major objective of drying of food products are the reduction of the moisture content to a level, which allows safe storage over an extended period. Hot air drying, sun drying, solar drying, microwave drying, and freeze drying are among the most commonly used methods to dry and preserve fruits and vegetables [1]. Several papers deal with peas drying. Green pea is a leguminous vegetable of huge importance consumed in several forms such as fresh green peas, dehydrated peas and processed canned peas. Drying kinetics is very important to understand the fundamental mechanism of a process with the aim to make energy efficient dryer with optimized and controlled operating conditions [2]. The drying air temperature during the falling rate drying period had a great effect on drying kinetics. The drying rate reached its maximum values at higher drying air temperatures. Drying rate decreases continuously with decreasing moisture content or improving drying time. In stagnant bed drying, complex unsteady-state heat and mass transport phenomena took place. The most important parameter is heat and mass transfer rates which affect on drying product quality as well as energy consumption. The heat and mass transfer rates are associated with the local values of drying air temperature, humidity and velocity [3,4].

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2. Liberalization of electricity market, impact on supply security, energy efficiency and effective operation of Power Plants (development and operation of the deregulated energy market; energy efficiency of processes and equipments used for power generation by thermal /hydro/wind and other Power Plants; research and modeling of processes in steam boilers, turbines and other equipment of thermal /hydro/wind and other Power Plants; combined production of heat and power, reliability and availability of facilities and Power Plants; effective utilization and reduction of fuel consumption; optimization of processes, equipment, facilities and whole Power Plants; economic handling of processes; rationalizations and innovations of the production processes; introduction of system of quality);
3. Questions concerning Power Plants life cycle extension and introduction of advanced clean coal and low carbon power generation technologies and equipments (policy and instruments for investment in new facilities; diagnostic of equipment conditions and remaining exploitation period, process diagnostic, planning, realization and analysis of revitalization, improvements of mechanical and electrical equipment);
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Abstract: Boiler and Electrostatic precipitator system (ESP) of the unit 300 MWe of Thermal Power Plant Ugljevik started operation in 1985 and so far it has been operating over 150.000 hours. In the previous period, no significant reconstruction of ESP was carried out except replacement of emission electrodes. As a consequence, failure of certain electrical components as well as mechanical damage on the internal elements of the ESP frequently occurred while particulate matter concentration at the exit of ESP was over 1000 mg/Nm^3. In order to reduce particulate matter emission according to EU Directive 2001/80 and to improve availability of the facility, management of Thermal Power Plant Ugljevik decided to proceed with the reconstruction or replacement of the existing ESP with modern high-efficiency and reliably ESP. Compared to guaranteed dedusting efficiency of 99,693% and emission <150 mg/Nm^3 for the original ESP design, the contractual requirements for the new ESP are set to be better than 99,935%, allowing dust concentration downstream ESP to be less than 50 mg/Nm^3.

During the 2017 a new ESP was built by Consortium ZVVZ-Enven Engineering a.s/ZK-Thermchem s.r.o. from Czech Republik. The original ESP design, consisted of two separate ESP chambers, each with active volume of 14m x 14.6 m x 14.6 m and containing 4 separated fields in 4 dedusting zones, have been changed by new ESP to one integral chamber construction of 16,5 m x 34,5 m x 17,92 m active volume, with 15 electrical fields in 4 dedusting zones.

This paper presents the technical characteristics of old and new ESP design, results of Guarantee Tests A measurements, laboratory analysis of the coal, fly and bottom ash samples, comparatively to the guaranteed ones, working parameters of the unit and upgraded ESP during the measurements as well as results of the calculations. Based on results of measurements and calculation, it was proved that under normal and guarantee working conditions of the boiler and ESP, the concentration of particulate matter in flue gases at the exit of upgraded ESP do not exceed value of 50 mg/Nm^3, while ESP achieved dedusting efficiency just below guaranteed value of 99,935%.

Keywords: emission, electrostatic precipitator, particulate matter, reconstruction.

1. Introduction

Thermal power plant (TPP) ‘’Ugljevik’’ started with production in 1985. With installed power of 300 MW and projected annual production of 1,601 GWh, unit I of TPP "Ugljevik" was designed to work 200000 hours. Because of the war in Bosnia and Herzegovina the TPP was out of operation in the period April 1992 – November 1995. From the beginning of production till the end of 2006,

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COMPARISON OF THE CLASSICAL LIME/LIMESTONE AND WET REGENERATIVE ABSORPTION PROCESS BASED ON PHYSICAL/CHEMICAL ABSORPTION IN ORGANIC SOLVENTS FOR FLUE GAS DESULPHURISATION

Nikola Živković, Predrag Stefanović (University of Belgrade, Institute for Nuclear Sciences "Vinča", Belgrade, Serbia), Emila Živković (University of Belgrade, Faculty for Technology and Metallurgy, Belgrade, Serbia), Milić Erić, Zoran Marković (University of Belgrade, Institute for Nuclear Sciences "Vinča", Belgrade, Serbia)
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Abstract: The multiple harmful effect of emitted Sulfur-dioxide (SO_2) in the atmosphere is well known. It is manifested in the form of respiratory problems in humans, and is also a source of acid rain that is harmful to the biological world and construction objects. Energy and industrial activities have the major share in SO_2 emissions, with the dominant role of combustion of fossil fuels (coal and oil) in thermal power and industrial plants. The first steps towards the removal of SO_2 from flue gases date more than a century ago, when a classic lime/limestone process is patented, which is still the most world widespread process. Since the long time significanace of flue gas desulphurisation (FGD), the aforementioned lime/limestone process with certain modifications has a significant representation.

However, in recent times, a new group of regenerative absorption processes based on physical/chemical absorption of SO_2 in organic solvents are present with the increasing rate. These processes are gaining importance because of their main advantage, avoiding the accumulation of large quantities of solid by-products, such as gypsum in lime/limestone process.

The paper presents a comparison of the two groups of procedures. Comparison is carried out according to several aspects: their general representation in operational use, applicability for certain types of plants (thermal, industrial and other), in terms of capital and annular costs, process efficiency, flexibility of process parameters, market usability of the final product from the process and environmental aspects.

Key words: Sulfur-dioxide, Flue gas desulphurisation, Regenerative absorption, Lime/Limestone process.

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A critical review of the research of the low-rank coal, biomass, and coal-biomass blends devolatilization: experimental research and mathematical modeling

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ABSTRACT

The Western Balkans produce about 60% of electricity burning low-quality coals, which causes high GHG emissions. Co-firing of coal and biomass is among the most attractive approaches for decreasing these emissions. The present work aims to offer an in-depth critical review of the current status of low-quality coal, biomass, and coal/biomass devolatilization research to serve as a good base for future research in the field. Paper provides a thorough analysis of experimental methods and critical analysis of achieved experimental results, together with the basic set of computational models, models' accuracy, and applicability for coal/biomass devolatilization modeling. Biomass compared to coal devolatilization occurs at lower temperatures and produces more light gases and tar. Interactions between coal and biomass during coal/biomass blends devolatilization is not completely understood. Complex network devolatilization models offer the possibility to derive input parameters for simpler kinetic devolatilization models that are suitable for implementation in CFD codes.

KEYWORDS
Coal, Biomass, Devolatilization, Co-fuel, Volatiles, Tar, Mathematical Modelling.

INTRODUCTION

Primary energy consumption continues to increase, with 2.2% in 2017, which is rise from 1.2% in 2016 and the highest growth since 2013. Global coal production increased by 3.2%, at the highest rate from 2011. Coal still has a dominant position in global power generation, with a share of 44%, in 2017 alone coal generation increased by 3%, which is the first time in four years [1]. However, coal reserves are being spent rapidly. It is expected that, at the current consumption rate, proven coal reserves will last for another 150 years [2]. Another alarming issue is CO_2 emitted from power plants firing coal. CO_2 is the main source of GHG emissions with a share of 73%. About 40% of the total CO_2 emitted to the atmosphere comes from coal combustion [3]. Worldwide concerns of climate change and global warming intensified the need for alternate, carbon neutral, energy resources.

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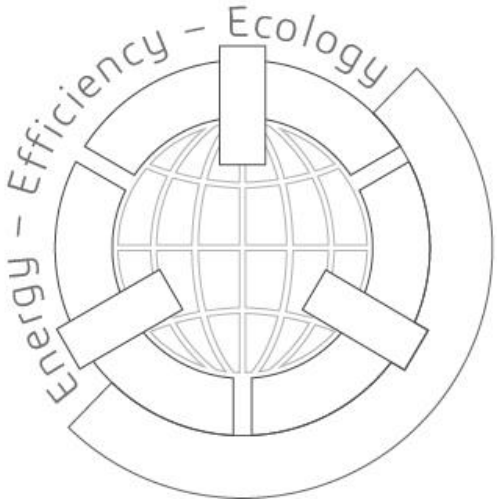

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Problem of Gas Distribution in Electrostatic Precipitators of Unit A4 in TPP Nikola Tesla

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Abstract: Annual reports of dust emission from unit A4 of the thermal power plant "Nikola Tesla" in Obrenovac for the period 2014-2015 showed that the emission was close to or over the limit value (ELV). Solution for the reconstruction of the electrostatic precipitator (ESP) was requested in order to increase dedusting efficiency of ESP and to reduce the emission to a level below ELV in the expected working conditions of the increased power of unit A4. The flow nonuniformity in the ESP chamber is considered an important influencing parameter on the dedusting efficiency. This paper presents results of the investigation of flue gas flow distribution through the inlet and outlet channels as well as inside of the ESP chambers. The research included measurements of the fluid velocity field in the channels and ESP chamber combined with a series of computational fluid dynamics simulations on several different numerical models of ESP. The experimental work aimed at investigating the nonuniformities of the flow in the ESP chamber. The numerical simulation tools were used to investigate the dependence of velocity distribution in the ESP chamber and pressure losses through the ESP with respect to the geometrical parameters of different proposed concepts of guiding blades. The goal was to select a concept that provides better uniformity of the gas velocity thus higher particle residence time in the ESP chamber and higher dedusting efficiency of the ESP. After ESP reconstruction, continuous measurements conducted over a period of 60 days confirmed particulate emission from unit A4 at a level much lower than ELV.

Keywords: electrostatic precipitator, particulate emission, computational fluid dynamics simulations, measurements.

1. Introduction

A particulate emission is one of the most serious environmental problems which may cause great health hazards to people, especially for the children and the elderly [1]. Electricity production in the Republic of Serbia is mainly based on the combustion of low-quality lignite from open-pit mines in thermal power plants, with a share of 70% in the power generation, therefore significantly contribute to overall particulate emission in Serbia. For particulate removal from the flue gas, Serbian thermal power plants are equipped with dry plate-type electrostatic precipitators (ESP), with a dust removal efficiency of more than 99,9%. Annual reports on periodic and continuous measurements of dust concentration from unit A4 for the period 2014- 2015 indicated that the outlet concentration was close to or over the emission limit values (ELV) of $50 mgNm^{-3}$. As a degradation of coal quality in the following years is expected, reflected in a higher content of mineral matter in the coal, it will result in a reduction of dust removal efficiency of the ESP and dust emission will exceed ELV. Therefore, the management of the PE EPS Serbia decided that upgrading of electrical equipment, as well as flue gas control equipment of the ESP of unit A4, should be carried out in order to increase dedusting efficiency of ESP and to reduce the emission to a level below ELV under the new and worsened working conditions.

The precipitation process in ESP basically involves convection-diffusion transport process of particles superposed with the effect of particle drift governed by the local strength of the electric field, while drag and Coulomb force acting on the particle are of much greater magnitudes compared to particle gravity. Many

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Review of Particulate Matter Emission Reduction at the TPP Nikola Tesla A after Reconstruction and Modernization all Six Units

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Abstract: Public Enterprise "Electric Power Industry of Serbia" has harmonized their operation in accordance with regulations with EU requirements related to the limitation of the emission of certain pollutants into the air from large combustion plants until 2016. Among other measures, electrostatic precipitators reconstructions of the intended units were completed until 2015. Reduction of the outlet concentration of particulate matter was mainly achieved by increasing of height and number of collecting electrodes of electrostatic precipitators. Additional measures were adding one additional field of electrodes and enhancement of current and voltage characteristics of electrostatic precipitator sections. Suppliers of electrostatic precipitators guaranteed the outlet concentration of particulate matter ≤ 50 mg/m^3 and it was also confirmed by the guarantee investigations in accordance with standard ISO 9096. Thermal Power plant Nikola Tesla A, as the largest power plant in Serbia, consist of six units which electrostatic precipitators were reconstructed and modernized. This paper present results of guarantee, periodic-intermittent and automatic measuring system (AMS) tests of particulate matter concentration after the reconstruction and several years later and indicate problems in power plant operation.

Keywords: particulate matter, emission, electrostatic precipitator, reconstruction, modernization.

1. Introduction

In order to preserve the environment, thermal power plants, as one of the biggest polluters, invest significant funds in the construction of new facilities to reduce the emission of dust, sulfur and nitrogen oxides.

The long-term investigations of the particulate matter emission by authorized and accredited institutions, before the reconstruction of electrostatic precipitators, determined that the highest level of emissions of 2000 mg/Nm^3 for units A1 and A2, while for units A3 to A6, the emission were in the range from 80 to 400 mg/Nm^3. The oldest units A1 and A2, with the lowest degree of dedusting before reconstruction, had in the total particulate matter emission share of 66% in TPP Nikola Tesla A, and producing only 15% of the TPP total electricity production [1].

The Electric Power Industry of Serbia has adopted a long-term modernization program to reduce environmental pollution. In order to reduce particulate matter concentration to the level of below 50 mg/Nm³, the reconstructions and modernizations of the existing electrostatic precipitators were carried out between 2004-2014 at all six units of the TPP "Nikola Tesla".

Electrostatic precipitators of the thermal power plant Nikola Tesla were reconstructed and modernized by a consortium of companies from Poland RAFAKO S.A., ELWO S.A. and companies from Serbia Energoprojekt-Oprema and Energoprojekt-Entel [2-7].

The aim of this paper is to analyze all six units operations after reconstruction and modernization, in terms of the particulate matter emission into the air and to indicate the problems that need to be fixed.

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Homogeneity Assessment of the Velocity Distribution in the Chamber of Electrostatic Precipitator of Unit A1 in TPP Nikola Tesla

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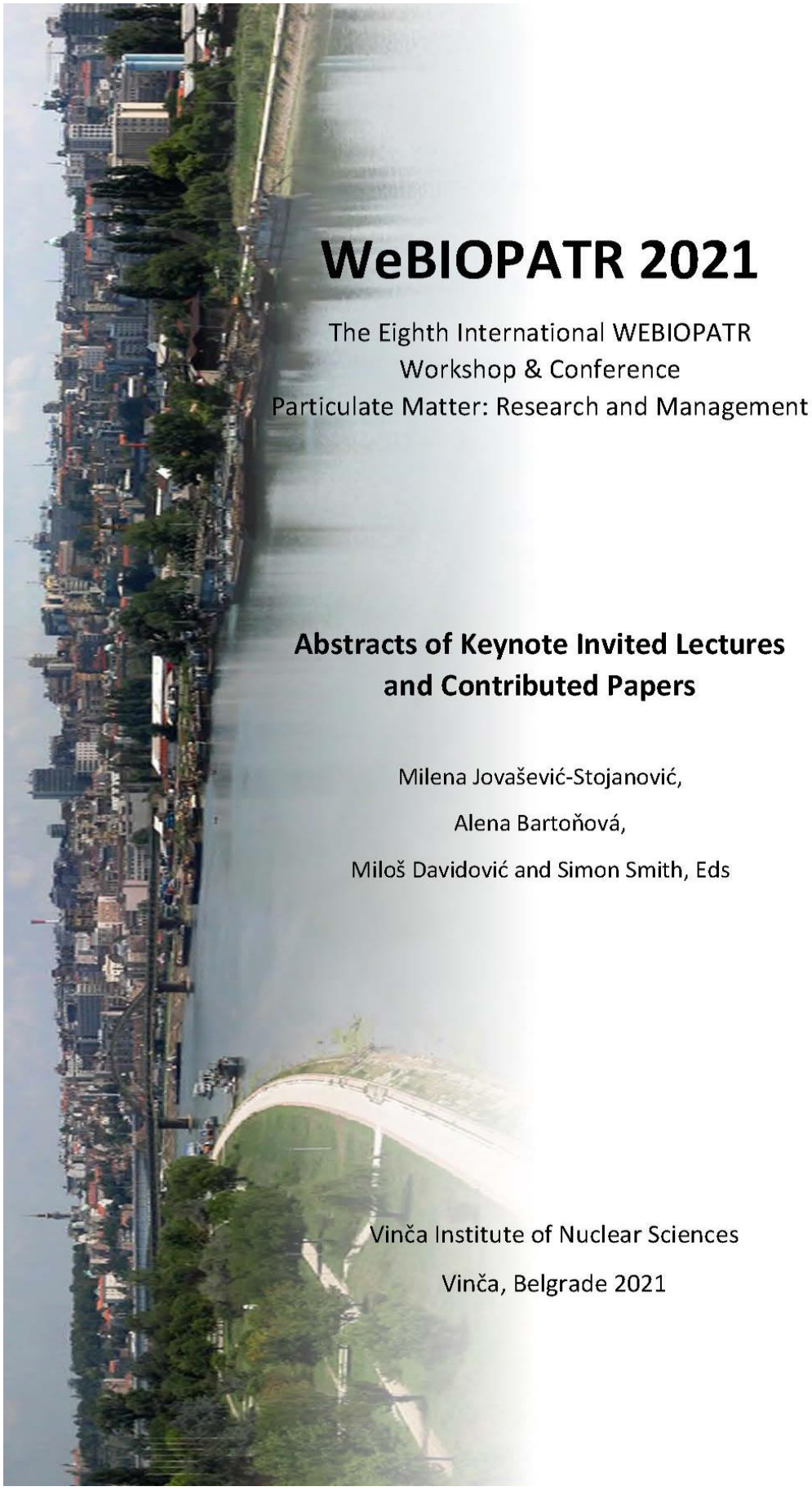
Abstract: To obtain the optimum dedusting efficiency of an electrostatic precipitator, the flue gas should be uniformly distributed over the precipitator's vertical cross-section. This paper presents the results of the homogeneity assessment of the velocity distribution in vertical cross-sections of the electrostatic precipitator of unit A1 in the thermal power plant Nikola Tesla in Obrenovac. Velocity measurements were conducted in the front of the first and after the last electrical field of the precipitator. The coefficient of variation, momentum correction coefficient, energy correction coefficient, and linear and quadratic norm-based metrics of flow uniformity were calculated based on the values of velocities measured in the vertical cross-sections of interest and compared. In addition, a percent of the total area of the cross-section that exhibits velocities less than 85%, greater than 115%·and greater than 140% of the average velocity in the cross-section were calculated. The analysis indicated unfavorable velocity distribution resulting in poor homogeneity of the flow field through the chamber of the precipitator regarding all calculated parameters, therefore in a decrease in the precipitator's efficiency and an increase in particulate matter emission.

Keywords: electrostatic precipitator, velocity measurements, flow homogeneity assessment

1. Introduction

For the removal of particulate matter (PM) from the flue gas, the low-rank lignite-fired unit A1 of the thermal power plant Nikola Tesla in Obrenovac is equipped with two-chamber dry plate-type electrostatic precipitators (ESP). According to the results of periodic measurements carried out in 2016 and 2018, i.e. continuous measurements in 2017, the PM emission from unit A1 exceeded the emission limit value (ELV) of 50 mg/Nm3. The major overhaul of the unit is planned for 2022/2023 and it is expected that the unit will be at a longer standstill (12 months). During that overhaul, the primary measures for the nitrogen oxide emission reduction from unit A1 are planned to be introduced. At the same time, the appropriate refurbishment of the ESP could be done in order to increase their efficiency. For this purpose, during the overhaul of unit A1 in 2020, certain reconstructions were made only on ductwork of the left chamber of the ESP. An comprehensive analysis was necessary in order to check the effects of the implemented reconstructions and to determine the limitations for achieving the required high efficiency of the ESP as well as to propose the measures that could be implemented during the overhaul in order to improve their efficiency and to reduce PM emission. It was demanded to determine the velocity distribution in the chambers of ESP of unit A1 and to assess the uniformity of the flow through the ESP as one of the main influencing factors on the ESP efficiency [1]. This paper presents the results of the velocity measurements in the chamber of the ESP of unit A1 conducted on 2.11.2020. The goal was to assess the homogeneity of the velocity distribution in the vertical cross-sections of the ESP chamber. Measurement of the velocity distribution in the ESP chamber is a demanding task. In such a test, the gas velocity is measured over the entire cross-section of the ESP. This test is conducted''offline'', with the unit and ESP out of operation and a flue gas fan (FGF) in operation, generating the necessary airflow through the ESP chamber and ductwork for the measurement. Particle Image Velocimetry (PIV) [2,3] and Laser Doppler Velocimetry (LDV) [4] are primarily applicable in laboratory conditions for the cases of small measuring domains and low gas velocities. For on-site measurements of the air velocity distribution in the large vertical

Саопштење са међународног скупа штампано у изводу М34-(1)



ABSTRACTS OF KEYNOTE INVITED LECTURES AND CONTRIBUTED PAPERS

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Particulate Matter: Research and Management

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11.15 NUMERICAL SIMULATION OF GAS FLOW THROUGH PERFORATED PLATES INCLINED TO THE MAIN FLOW

Z. Marković (1), R. Jovanović (1), M. Erić (1) and I. Lazović (1)
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Background and Aims: The new, restrictive best available technology requirements posed by EU Decision 2017/1442 clearly define the need to take measures to improve existing flue gas treatment installations. The process of removing particulate matter from the flue gas generated in coal-fired boilers of thermal power plants, by electrostatic precipitators (ESP), or by using filter bags, is significantly affected by uniformity of flue gas flow through the dedusting zone (Bäck, 2017). In order to improve the flue gas flow distribution through the ESP, perforated plates are used to establish as uniform as possible flow over the cross-section of the wide-angle diffuser exit. A computational Fluid Dynamics (CFD) method with source terms in the momentum equation defined according to the porous medium model is widely used for numerical simulation of flow through the perforated plate. Permeability and internal resistance per unit thickness of the perforated plate, considered as homogenous porous material, are usually calculated based on results of experiments. With these parameters defined for the streamwise direction, the porous medium model is useful in cases where the incoming velocity is almost perpendicular to the perforated plate. But this model loses prediction accuracy for the velocity distribution behind the perforated plate, as well as for the pressure drop through the plate, when the direction of the incoming fluid velocity deviates from the perpendicular (Guo et al, 2013), which is always the case for the wide-angle diffuser of one ESP. The aim of the present work is to add to the existing porous medium model when used in modelling a perforated plate by introducing a new approach for determination of the momentum losses regarding both streamwise and transverse directions for wide range of yaw and pitch angles of incoming flow.

Methods: The permeabilities and loss coefficients are calculated based on the results of CFD numerical simulations for different angles of incoming flow. The numerical calculations were performed by using ANSYS CFX finite-volume-based software to resolve the RANS equation for the solution domain. The key simulation properties are defined to be parameters representing one design point. The output parameters for all design points are solved by using Design of Experiments (DOE) technique. The permeability and loss coefficient algebraic dependencies on the angle are defined and implemented in the porous medium model. The proposed procedure is applied on the case of a plate of thickness 5mm, with face porosity 0.3 formed of circular openings in quadrilateral pitch.

Key results of the study: The results obtained for several pitch and yaw angles by applying the proposed approach are compared to the results of the full-scale CFD numerical simulations as well as to the CFD simulations relying on the standard porous medium model with permeability and loss coefficient defined in the direction orthogonal to the perforated plate An acceptable correlation was obtained and directions for future work highlighted (influence of the wall and other structural elements).

Conclusions: The study shows that the proposed approach is suited to predict pressure drop and velocity distribution behind the perforated plate for a wide range of yaw and pitch angles of incoming flow. More reliable prediction of the flow distribution in the exit of the wide-angle diffuser allows optimization of the flow through the ESP, and therefore a decrease in particulate matter emission.

Acknowledgements: This work was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia, research theme: Improving the efficiency of equipment for waste gas purification and exploitation processes by increasing the fuel quality and assessing the impact on air pollution, which is being realized in „VINČA" Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia.

Keywords: perforated plate, porous medium model, CFD, DOE.

REFERENCES

Bäck, A. 2017. Relation Between Gas Velocity Profile and Apparent Migration Velocity in Electrostatic Precipitators, International Journal of Plasma Environmental Science & Technology 11 (1), 104-111

Guo, B.Y., Hou, Q.F., Yu, A.B., Li, L.F. and Guo, J. 2013. Numerical modelling of the gas flow through perforated plates, Chemical Engineering Research and Design 91, 403-408

M92 Регистрован патент на националном нивоу M92-(1)

РЕПУБЛИКА СРБИЈА
ЗАВОД ЗА ИНТЕЛЕКТУАЛНУ СВОЈИНУ
СЕКТОР ЗА ПАТЕНТЕ
ОДЕЉЕЊЕ ЗА МАШИНСТВО,
ЕЛЕКТРОТЕХНИКУ И ОПШТУ ТЕХНИКУ
990 број 2022/10939-МП-2022/0043
Датум: 1.11.2022. године
Београд, Кнегиње Љубице 5
2-1/7

Завод за интелектуалну својину у Београду, Кнегиње Љубице 5, и то овлашћено службено лице Мирјана Јелић, на основу члана 36. Закона о министарствима („Службени гласник РС", бр. 128/20 и 116/22), чл. 67, 69, 70. 109, 111, 164. и 167. Закона о патентима („Службени гласник РС", бр. 99/11, 113/17 - др. закон, 95/18, 66/19 и 123/21) и Решења о преносу овлашћења за доношење и потписивање управних и других аката Завода за интелектуалну својину 990 број 021-18245/2021-01 од 1.12.2021. године, у управном поступку по пријави малог патента број МП-2022/0043 од 25.3.2022. године, подносиоца Институт за нуклеарне науке Винча - Институт од националног значаја, Универзитет у Београду, Мике Петровића Аласа 12-14, 11351 Београд-Винча, ради признања малог патента, донео је 1.11.2022. године

Р Е Ш Е Њ Е

1. ПРИЗНАЈЕ СЕ правном лицу Институт за нуклеарне науке Винча - Институт од националног значаја, Универзитет у Београду, Мике Петровића Аласа 12-14, 11351 Београд-Винча, мали патент по пријави број МП-2022/0043 од 25.3.2022. године, за проналазак под називом: „ТРАНСПОРТНА КОЛИЦА ЗА ИСПИТИВАЊЕ ПРОФИЛА БРЗИНА ОТПАДНОГ ГАСА У КОМОРАМА ЕЛЕКТРОФИЛТЕРСКИХ ПОСТРОЈЕЊА ВЕЛИКИХ ЕМИТЕРА", према опису, патентним захтевима и цртежима из патентног списа.

2. УПИСУЈЕ СЕ у Регистар малих патената Завода за интелектуалну својину признато право из тачке 1. диспозитива овог решења под бројем

1775

3. Податке о признатом праву објавити у „Гласнику интелектуалне својине", број 11/2022.

О б р а з л о ж е њ е

Правно лице Институт за нуклеарне науке Винча - Институт од националног значаја, Универзитет у Београду, Мике Петровића Аласа 12-14, 11351 Београд-Винча, подносилац је пријаве малог патента број МП-2022/0043 од 25.3.2022. године, за проналазак под називом наведеним у диспозитиву решења.

У спроведеном поступку за признање малог патента утврђено је да су испуњени услови из члана 164. став 1. Закона о патентима.

Имајући у виду наведено, Завод за интелектуалну својину је, на основу чл. 164, 167, 109. и 111. Закона о патентима, одлучио као у диспозитиву овог решења.

Подносилац пријаве ослобођен је плаћања републичких административних такси на основу одредбе члана 18. став 1. тачка 4) Закона о републичким административним таксама („Службени гласник РС”, бр. 43/03, 51/03 – исправка, 53/04, 42/05, 61/05, 101/05 – др. закон, 42/06, 47/07, 54/08, 5/09, 54/09, 35/10, 50/11, 70/11, 55/12, 93/12, 47/13, 65/13 – др. закон, 57/14, 45/15, 83/15, 112/15, 50/16, 61/17, 113/17, 3/18 – исправка, 50/18, 95/18, 38/19, 86/19, 90/19 – исправка, 98/20, 144/20 и 62/21 – усклађени дин. износи).

Упутство о правном средству:

Против овог решења може се изјавити жалба Влади Републике Србије у року од 15 дана од дана његовог пријема, а преко овог завода. Уз жалбу треба доставити доказ о уплати административне таксе у износу од 490,00 динара.

Решење доставити:
- подносиоцу пријаве

Институт за нуклеарне науке Винча
Институт од националног значаја
Универзитет у Београду
Мике Петровића Аласа 12-14
11351 Београд-Винча
- у спис

Саветник

Мирјана Јелић

Информативни подаци о малом патенту/пријави малог патента

Регистарски број (Registration number)	1775
Број и датум решења о признању права (Number and date of decision to grant the right)	2022/10939 01.11.2022
Број пријаве (Application number)	МП-2022/0043
Датум пријема пријаве (Reception date)	25.03.2022
Признати датум подношења пријаве (Filing date)	25.03.2022
Статус (Legal status)	Регистрован (Registered)
Међународна класификација патената (IPC)	B03C 3/36
Назив проналаска (Title of invention)	TRANSPORTNA KOLICA ZA ISPITIVANJE PROFILA BRZINA OTPADNOG GASA U KOMORAMA ELEKTROFILTERSKIH POSTROJENJA VELIKIH EMITERA TRANSPORT TROLLEYS FOR ANEMOMETERS FOR TESTING THE AIR VELOCITY PROFILE IN THE CHAMBERS OF ELECTROSTATIC PRECIPITATORS OF LARGE EMITTERS
Подаци о проналазачу (Inventor)	LAZOVIĆ, Ivan MARKOVIĆ, Zoran ERIĆ, Milić JOVANOVIĆ, Rastko TASIĆ, Viša
Подаци о носиоцу права (Owner)	INSTITUT ZA NUKLEARNE NAUKE VINČA-INSTITUT OD NACIONALNOG ZNAČAJA, UNIVERZITET U BEOGRADU, Mike Petrovića Alasa 12-14, 11351 Beograd-Vinča, RS

Акција (Action): Priznaj mali patent

Датум акције (Action date)	01.11.2022

РЕПУБЛИКА СРБИЈА
ЗАВОД ЗА ИНТЕЛЕКТУАЛНУ СВОЈИНУ

REPUBLIC OF SERBIA
INTELLECTUAL PROPERTY OFFICE

ISSN 2217 - 9143 (Online)

ГЛАСНИК ИНТЕЛЕКТУАЛНЕ СВОЈИНЕ

INTELLECTUAL PROPERTY GAZETTE

Београд / Belgrade **2022/11**

Завод за интелектуалну својину Републике Србије
The Intellectual Property Office of the Republic of Serbia

ГЛАСНИК ИНТЕЛЕКТУАЛНЕ СВОЈИНЕ

INTELLECTUAL PROPERTY GAZETTE

ГЛАСНИК ИНТЕЛЕКТУАЛНЕ СВОЈИНЕ	Година излажења CII	2022	број 11	P 63646 - 63720 U 1774 - 1775 Ж 83393 - 83580 Д 11661 - 11665	Датум објављивања: 30.11.2022. Београд

Издаје и штампа: **Завод за интелектуалну својину,** Београд, Кнегиње Љубице 5, Београд, Србија
Телефони: 011 20 25 800 (централа); факс: 011 311 23 77
E-mail: zis@zis.gov.rs
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САДРЖАЈ / Contents

МАЛИ ПАТЕНТИ / Petty Patents

(51) ***A01G 23/099*** (2006.01) **(11) 1774 U1**
B25F 1/02 (2006.01)
(21) **MP-2022/0065** (22) 20.09.2022.
(54) OBELEŽIVAČ STABALA SA SEČIVOM
TREE MARKER WITH A HEWING KNIFE
(73) INSTITUT ZA ŠUMARSTVO, Kneza Višeslava 3, 11030 Beograd, RS
(72) HADROVIĆ, Sabahudin, dr, Rajka Ackovića 101, 36300, Novi Pazar, RS; JOVANOVIĆ, Filip,dr, Zadrugarska 14b, 11080, Beograd, RS; BRAUNOVIĆ, Sonja, dr, Stanoja Glavaša 31, 11060, Beograd, RS; ĆIRKOVIĆ-MITROVIĆ, Tatjana, dr, Belo vrelo 21/1, 11030, Beograd, RS; MLADENOVIĆ, Katarina, dr, Stevana Sremca 3, 11000, Beograd, RS; JOVIĆ, Đorđe, dr, Nedeljka Čabrinovića 64, 11030, Beograd, RS; MARKOVIĆ, Miroslava, dr, Milorada Draškovića 46, 11090, Beograd, RS

(51) ***B03C 3/36*** (2006.01) **(11) 1775 U1**
(21) **MP-2022/0043** (22) 25.03.2022.
(54) TRANSPORTNA KOLICA ZA ISPITIVANJE PROFILA BRZINA OTPADNOG GASA U KOMORAMA ELEKTROFILTERSKIH POSTROJENJA VELIKIH EMITERA
TRANSPORT TROLLEYS FOR ANEMOMETERS FOR TESTING THE AIR VELOCITY PROFILE IN THE CHAMBERS OF ELECTROSTATIC PRECIPITATORS OF LARGE EMITTERS
(73) INSTITUT ZA NUKLEARNE NAUKE VINČA-INSTITUT OD NACIONALNOG ZNAČAJA, UNIVERZITET U BEOGRADU, Mike Petrovića Alasa 12-14, 11351 Beograd-Vinča, RS
(72) LAZOVIĆ, Ivan, Ljubomira Stojanovića 34/21, 11060, Beograd, RS; MARKOVIĆ, Zoran, Jovanke Radaković 68a/11, 11160, Beograd, RS; ERIĆ, Milić, Živanićeva 22, 11253, Beograd, RS; JOVANOVIĆ, Rastko, Homoljska 1/5, 11060, Beograd, RS; TASIĆ, Viša, Đorđa Andrejevića Kuna 19/5, 19210, Bor, RS

Актуелни анекс уговора о раду

ИНСТИТУТ ЗА НУКЛЕАРНЕ НАУКЕ „ВИНЧА“
ИНСТИТУТ ОД НАЦИОНАЛНОГ ЗНАЧАЈА ЗА РЕПУБЛИКУ СРБИЈУ
УНИВЕРЗИТЕТ У БЕОГРАДУ
Деловодни број: 101-197-3/2020-140
Дана: 29.06.2020. године

На основу чл. 171. став 1. тачка 5) и 6) и чл. 192. Закона о раду („Сл. Гласник РС“, бр. 24/2005, 61/2005, 54/2009, 32/2013, 75/2014, 13/2017 - одлука УС, 113/2017 и 95/2018 - аутентично тумачење), члана 121. Правилника о раду Института за нуклеарне науке „Винча“, члана 36. Статута Института за нуклеарне науке „Винча“ и члана 63 став 1. тачка 8) Закона о науци и истраживањима (Сл. Гл. Републике Србије 49/2019), између:

1. **Института за нуклеарне науке „Винча“- Институт од националног значаја за Републику Србију- Универзитет у Београду**, Винча – Београд, ул. Мике Петровића Аласа бр. 12-14, кога заступа в.д. директора Института Проф. др Снежана Пајовић (у даљем тексту: Послодавац)

и

2. **Др Милића Ерића** из Београда, ул. Живанићева бр. 22, ЈМБГ: 2003970710325, (у даљем тексту: Запослени)

закључује се

АНЕКС 4
УГОВОРА О РАДУ
Број: 1455 од 29.09.2005. године
закљученог између в.д. директора Института „ВИНЧА“ с једне стране и
Запосленог др Милића Ерића, с друге стране

Члан. 1.

МЕЊА СЕ **члан 2.** Анекса 2 број: 101-67-2/2018-140 од 21.06.2018. године Уговора о раду број : 1455 од 29.09.2005. године, тако да исти сада гласи:

„- Запослени др Милић Ерић, распоређен за обављање послова **НАУЧНИ САРАДНИК** у Лабораторији за термотехнику и енергетику- 140, организационој јединици Института „Винча“ ће обављати следеће послове:
- руковођење научно- истраживачким пројектима или њиховим деловима и другим уговорним задацима из области делатности Лабораторије;
- руковођење израдом дипломских и мастер радова студената и докторских теза сарадника Лабораторије из области њених делатности;
- припремање стратешки дугорочних научно-истраживачких програма рада;
- обједињавање резултата истраживања и њихово усмеравање на различите области примене;
- планирање развоја научно- истраживачких области у којима ради Институт;
- учествовање у припреми и доношењу дугорочних планова везаних за развој и примену научно-истраживачког рада;
- руковођење израдом докторских дисертација;

представљање и руковођење целинама које врше испитивања, еталонирања и/или атестирања по стандардним методама, а по овлашћењу директора Института;
- руковођење пословима система квалитета у области испитивања и метрологије у складу са Пословником о квалитету и процедурама лабораторија за испитивање и метролошких лабораторија, а по овлашћењу директора Института;
- обављање послова испитивања и атестирања по стандардним методама, а по овлашћењу директора Института и
- обавља друге послове по налогу непосредног руководиоца у оквиру стручне спреме и способности стечених радом.

Као и послове:
a. Учесник пројекта „CFD симулација електрофилтера блокова А1 и А2“ ;
b. овлашћени представник Института „Винча“ за праћење реализације и учесник пројекта „Модернизација скретних и пригушних елемената испре и иза електрофилтера у циљу обезбеђења равномерне брзине димног гаса у попречном пресеку коморе ЕФ“;
c. Члан експертског тима Института „Винча“ у међународном пројекту „ Consulting services related to the measurement and testing of the ash In thermal power plant Kostolac A“;
d. Коришћења софтверског пакета ANSYS Academic Associate CFD за нумеричко решавање струјно-термичких проблема у пројектима под а. и b., као и у свим осталим домаћим и међународним научно-истраживачким и другим пројектима када се за примену наведеног софтвера укаже потреба.“

Запослени ће поред послова у оквиру радног места НАУЧНИ САРАДНИК, обављати и послове Руководиоца одељења екологије Лабораторије за горива и термотехничка испитивања.

Члан 2.

Уговорне стране заједнички констатују да су послови које ће запослени обављати, наведени у претходном члану, у свему одговарајуће врсти и степену стручне спреме запосленог, његовом радном искуству, здравственој и другим способностима.

Члан 3.

МЕЊА СЕ **члан 7**. Анекса 3 број: 101-275-2/2019-140 од 11.07.2019. године Уговора о раду број : 1455 од 29.09.2005. године, тако да исти сада гласи:

„Основна зарада за обављање послова радног места **НАУЧНИ САРАДНИК**, Т/2 категорије, у Лабораторији за термотехнику и енергетику-140 организационој јединици Института „Винча“, за пун месечни фонд ефективних часова рада и утврђени стандардно обављени посао износи **135.465,25 динара бруто I,** а обрачуната је множењем основице из члана 66. Правилника о раду Института за нуклеарне науке „Винча“ у износу од 47.648,70 динара бруто са утврђеним коефицијентом посла запосленог 2.8430 из члана 67. Правилника о раду Института „Винча“.

Међутим, с обзиром на компетентност, радно искуство и поседовање додатних знања у решавању проблема, поседовање креативности од утицаја на организациони учинак, висок ниво самосталности у раду, изузетно развијен ниво вештина комуникације и преговарања у пословним комуникацијама који је изнад стандардног, и значајне професионалне референце Запосленог у вези радног места научни сарадник, а који су неопходни за пословање Лабораторије за термотехнику и енергетику- 140, у складу са чланом 66. став 5. Правилнлика о раду Института „Винча“, између в.д. директора Института и запосленог уговорена је основна зарада у већем износу од основне зараде утврђене на

снову елемената из Правилника о раду Института „Винча“ и износи **202.000,00 динара бруто I месечно, на дан закључења овог Уговора, без минулог рада.**

Основна зарада запосленог се финансира:

1. из средстава буџета РС намењених институционалном финансирању истраживача,
2. из средстава остварених по основу учешћа запосленог у реализацији тржишних послова из области делатности Института и
3. из средстава остварених по основу учешћа запосленог у реализацији пројеката наведених у члану 1. став 3. овог Анекса.

Послодавац може запосленом кориговати зараду зависно од његовог личног ангажовања и успешности пословања-радни учинак и бонуси.
Корекцију основне зараде врши директор, у складу са законом и општим актима послодавца.
Анексом Уговора, послодавац и запослени могу уговорити прецизније критеријуме за оцену радног ангажовања запосленог-радног учинка и висину зараде на име таквог ангажовања.
Елементи за утврђивање основне зараде, радног учинка, накнаде зараде, увећане зараде и других примања запосленог уређена су Правилником о раду Института за нуклеарне науке “Винча”.“

Чл. 4.

Овај Анекс производи правно дејство од 01.07.2020. године.

Чл. 5.

Уз овај Анекс Уговора Послодавац је доставио Запосленом и писмено Обавештење које садржи: разлоге за понуђени анекс уговора, рок у коме запослени треба да се изјасни који не може бити краћи од осам радних дана и правне последице које могу да настану непотписивањем анекса уговора.

Чл. 6.

У осталом делу насловни Уговор о раду број 1455 од 29.09.2005. године и припадајући Анекси, остају неизмењени.

Чл. 7.

Овај Анекс сачињен је у 5 примерака од којих 4 примерка остају Институту, а један примерак се уручује запосленом.

ЗА ПОСЛОДАВЦА

ВИНЧА

Проф. Др Снежана Пајовић
в.д. директора Института

ЗАПОСЛЕНИ

Достављено:
1. запосленом _____ *(датум и потпис запосленог)*
2. одељењу обрачуна личних примања
3. служби људских ресурса
4. секретаријату ОЈ
5. архиви

30.06.2020.