

International journal
for science, technics and
innovations for the industry



MACHINES
TECHNOLOGIES
MATERIALS

YEAR XVIII Issue **1** / 2024 ISSN PRINT 1313-0226
ISSN WEB 1314-507X



Published by
Scientific technical
Union of Mechanical Engineering



MACHINES. TECHNOLOGIES. MATERIALS

INTERNATIONAL SCIENTIFIC JOURNAL

ISSN PRINT 1313-0226, ISSN WEB 1314-507X, YEAR XVIII, ISSUE 1 / 2024

INTERNATIONAL EDITORIAL BOARD

EDITOR IN CHIEF:

Georgi Popov Technical University of Sofia BG

MEMBERS:

Abdrakhman Naizabekov	Rudny industrial institute	KZ
Ahmet H. Ertas	Bursa Technical University	TR
Albert Albers	Karlsruhe Institut of Technology	DE
Andrzej Golabczak	Lodz University of Technology	PL
Dimitar Karaivanov	University of Chemical Technology and Metallurgy, Sofia	BG
Dobre Runchev	Ss. Cyril and Methodius University in Skopje	NM
Emilia Abadjieva	Akita University	JP
Erdem Camurlu	Akdeniz University, Antalya	TR
Eugen Sheregii	University of Rzeszow	PL
Franz Haas	Graz University of Technology	AT
Galina Nicolcheva	Technical University of Sofia	BG
Gennadii Bagliuk	Institute for Problems of Materials Science NAS of Ukraine, Kiev	UA
Georgii Raab	Ufa State Aviation Technical University	RU
Gregory Gurevich	Shamoon College of Engineering, Ashdod	IL
Hiroyuki Moriyama	Tokai University, Hiratsuka	JP
Idilia Batchkova	University of Chemical Technology and Metallurgy, Sofia	BG
Ivan Kralov	Technical University of Sofia	BG
Ivan Kuric	University of Zilina	SK
Julieta Kaleicheva	Technical University of Sofia	BG
Katia Vutova	Institute of Electronics, Bulgarian Academy of Sciences	BG
Maria Nikolova	Angel Kanchev University of Ruse	BG
Natasa Naprstkova	Jan Evangelista Purkyne University in Usti nad Labem	CZ
Oana Dodun	Gheorghe Asachi Technical University of Iasi	RO
Ognyan Andreev	Technical University of Sofia	BG
Predrag Dasic	High Technical Mechanical School of Trstenik	RS
Rasa Kandrotaitė	Kaunas University of Technology	LT
Raul Turmanidze	Georgian Technical University, Tbilisi	GE
Roumen Petrov	Ghent University	BE
Sergey Dobatkin	National University of Science and Technology "MISIS", Moscow	RU
Souren Mitra	Jadavpur University, Kolkata	IN
Svetlana Gubenko	National Metallurgical Academy of Ukraine, Dnipro	UA
Vedran Mrzljak	University of Rijeka	HR
Wu Kaiming	Wuhan University of Science and Technology	CN

TECHNICAL EDITORS:

M. Sc. Eng. Radoslav Daskalov,

M. Sc. Eng. Oleg Mihailov

All articles are published after peer review by two independent reviewers.

Scientific and technical union of mechanical engineering
108 R. S. Rakovski str., Sofia, Bulgaria
www.stumejournals.com, office@stumejournals.com

CONTENTS

MACHINES

Exergy analysis of a complex three-cylinder steam turbine at various loads Mrzljak Vedran, Poljak Igor, Prpić-Oršić Jasna, Delpin Roko	3
--	---

TECHNOLOGIES

Development of copper wire deformation technology Andrey V. Volokitin, Irina E. Volokitina; Anastasia Denissova	7
Charge activity of silicon-containing nanophase particles intended for modification of polymer matrices Evgeny Ovchinnikov, Tatyana Povshok, Sergey Yadykin	10
Processes for wire and arc additive manufacturing (overview) Evgeny Tongov, Vladimir Petkov, Plamen Tashev	13
Use of gamma irradiation processing for decomposition of aflatoxins in wheat flour Petya Kovacheva, Gergana Stamenova, Nelly Boshnakova	17
Technological characteristics of composite mixtures for the preparation of thermal insulation structural elements Lyuben Lakov, Krasimira Toncheva, Bojidar Jivov, Marieta Gacheva, Gabriel Peev, Dimo Mihaylov	21
Cathodic protection for cooling water system Klodian Gumeni, Jozef Kola, Joana Minga	25

MATERIALS

The influence of aging parameters on thermal, mechanical and structural properties of the EN AW-6060 aluminum alloy Uroš Stamenković, Ivana Marković, Vladan Ćosović, Boštjan Markoli	29
Experimental coatings for photovoltaic panels obtained by the sol-gel method based on compositions with the participation of Y₂O₃ and ZrO₂ Stancho Yordanov, Bojidar Jivov, Mariela Dimitrova, Tatyana Ivanova, Vladimir Petkov, Angel Velikov, Vladimir Blaskov, Boiko Krastev	33