

Advances in Composite Science and Technology 2018

IOP Conference Series: Materials Science and Engineering
Volume 683

Moscow, Russia
5 - 8 December 2018

ISBN: 978-1-7138-0935-7
ISSN: 1757-8981

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

This work is licensed under a Creative Commons Attribution 3.0 International Licence.
Licence details: <http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2020)

For permission requests, please contact the Institute of Physics
at the address below.

Institute of Physics
Dirac House, Temple Back
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481
Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

SYNTHESIS OF CROSS-LINKED POLYURETHANE WITH SELF-HEALING PROPERTIES	1
<i>E O Platonova, E Vlasov, A Kireynov, A V Polezhaev</i>	
SYNTHESIS OF SELF-HEALING POLYMERS PRECURSORS FROM AVAILABLE BIO-RENEWABLE RAW MATERIALS.	7
<i>D V Zakharova, A A Pavlov, A V Polezhaev</i>	
RESEARCH OF THE FATIGUE BEHAVIOR OF MULTILAYER STEEL MATERIAL BASED ON STEEL 08X18NI10 AND 08X18 AT HIGH VALUES OF CYCLE STRESSES UNDER CONDITIONS OF PURE BENDING.....	17
<i>A I Plokhikh, A A Minakov</i>	
SIMULATION OF THERMAL CONDITIONS OF ANTI-ICING SYSTEMS.....	22
<i>Yu I Dimitrienko, V Yu Chibisov, M N Koryakov, S V Lebedev</i>	
MODELING OF THE STABILITY OF THIN COMPOSITE PLATES BASED ON AN ASYMPTOTIC THEORY	28
<i>Yu I Dimitrienko, E A Gubareva, A A Shurpo</i>	
MODELING OF THE EFFECTIVE UNIVERSAL CONSTITUTIVE RELATIONS FOR ELASTIC LAMINATED COMPOSITES WITH FINITE STRAINS.....	34
<i>Yu I Dimitrienko, S B Karimov, D Yu Kolzhanova</i>	
COMPUTATIONAL MODELING OF THE CONJUGATED THERMOMECHANICAL AND AEROGASDYNAMICS PROCESSES FOR COMPOSITE STRUCTURES OF HIGH SPEED VEHICLES.....	40
<i>Yu Dimitrienko, A Zakharov, M Koryakov</i>	
MODELING OF NON-NEWTONIAN RESIN FLOWS IN COMPOSITE MICROSTRUCTURES.....	45
<i>Yu I Dimitrienko, Sh Li</i>	
MODELING OF THERMAL STRESSES IN INORGANIC MATRIX COMPOSITE PLATES BASED ON THE ASYMPTOTIC THEORY	51
<i>Yu I Dimitrienko, S V Sborschikov, E S Egoleva, D O Yakovlev</i>	
MODELLING OF FILTRATION OF LIQUID BINDER IN THE COMPOSITE TEXTILE STRUCTURES UNDER RTM PROCESSES	58
<i>Yu I Dimitrienko, I O Bogdanov</i>	
DISTRIBUTION OF ELECTROMAGNETIC FIELDS IN HETEROGENEOUS COMPOSITE STRUCTURES WHEN EXPOSED TO DIRECT CURRENT.....	64
<i>Yu I Dimitrienko, I K Krasnov, K M Zubarev</i>	
THEORY OF COMPOSITE CYLINDRICAL SHELLS UNDER QUASISTATIC VIBRATIONS, BASED ON AN ASYMPTOTIC ANALYSIS OF THE GENERAL VISCOELASTICITY THEORY EQUATIONS.....	72
<i>Yu I Dimitrienko, E A Gubareva, A E Pichugina</i>	
MULTI-PARAMETRIC DYNAMIC ANALYSIS OF LIGHTWEIGHT ELASTIC LAMINATES.....	78
<i>J Kaplunov, D A Prikazchikov, L A Prikazchikova, A Nikonov, T Savšek</i>	

INVERSE PROBLEMS OF RESTORING THE GEOMETRIC DIMENSIONS OF A CONSTRUCTION DEFECTS BY THERMAL FIELDS ANALYSIS	84
<i>I.K. Krasnov, A.A. Salnikova</i>	
ON THE MIXED STEKLOV—NEUMANN AND STEKLOV-TYPE BIHARMONIC PROBLEMS IN UNBOUNDED DOMAINS	91
<i>Hovik Matevossian</i>	
ON THE MODELING OF THIN BODIES OF REVOLUTION	100
<i>M U Nikabadze, M A Bogatyrev, A R Ulukhanyan</i>	
ON MODELING OF THREE-LAYERED THIN BODIES	107
<i>Mikhail Nikabadze, Armine Ulukhanyan, Andrey Khizhenkov</i>	
HOMOGENIZATION AND MULTICONTINUUM MODELS FOR HIGH CONTRAST COMPOSITES	114
<i>G P Panasenko</i>	
RESEARCH OF TEMPERATURE AND STRESS-STRAIN STATE OF MIRROR SPACE ANTENNA REFLECTOR WITH FINS BASED ON NONBRAIDED POLYESTER MATERIAL	118
<i>Y A Azhevsky, D Novikov</i>	
SELECTION OF COMPOSITE MATERIAL COMPOSITION FOR NON-EVAPORABLE GETTERS OF NEW GENERATION	124
<i>M V Aleksandrova, Y V Nikolyukin, Y A Kurganova</i>	
C/C COMPOSITES DEVELOPED FROM PHTHALONITRILE BASED COMPOSITES	132
<i>V V Aleshkevich, A V Babkin, V V Avdeev</i>	
REQUIREMENTS FOR TECHNICAL SUPPORT OF MEASUREMENTS OF LOCAL ELASTIC CHARACTERISTICS OF CCCM BY INDENTATION METHOD	139
<i>Y D Andreeva, I V Magnitskiy</i>	
MODELLING OF COMPOSITE ENERGY ABSORBING STRUCTURES FOR AUTOMOTIVE LOAD-BEARING SYSTEMS	146
<i>G A Harutyunyan, A B Kartashov</i>	
REDUCTION OF HEAT LOSS OF PUMP-COMPRESSOR PIPES FOR OIL PRODUCTION DUE TO OPTIMAL THERMAL INSULATION BASED ON BASALT AND GLASS FIBERS	154
<i>M A Komkov, Y V Badanina, A H Garashchenko</i>	
ANALYSIS OF THE INFORMATION AND DIAGNOSTIC CAPABILITY OF PROCESSING TECHNOLOGIES	160
<i>A A Barzov, V A Belov, A L Galinovski</i>	
THE INFORMATION-PHYSICAL MECHANISM OF DIAGNOSTIC OF THE FUNCTIONAL COATINGS EROSION WEAR BY WATER JET	167
<i>A A Barzov, A L Galinovski, A S Provatorov</i>	
THERMOPHYSICAL PROCESSES MODELS IN COMPOSITE WORKPIECES PROCESSED BY MICROWAVE RADIATION	175
<i>E S Belenkov, P V Prosuntsov, S V Reznik</i>	
THE METHOD OF REINFORCEMENT OF HOLES OF MECHANICAL FASTENERS WITH COMPOSITE LINERS	183
<i>F A Nasonov, B B Morozov, S V Bukharov, AV Zinin, K D Kharchenko, G S Piskunov</i>	

ADVANCED REPAIR METHODS USING WEAR-RESISTANT POLYMERIC COMPOSITE MATERIALS	187
<i>V A Ivanov, A B Tulinov</i>	
HIGH DENSITY POLYETHYLENE MODIFIED WITH CYCLOHEXYL DICHLORO-PHOSPHONATE	197
<i>A Kh Shaov, A M Kharaev, T A Borukaev, A S Borodulin, A N Kalinnikov</i>	
USE OF COMPOSITE MATERIALS TO INCREASE THE EFFECTIVENESS OF VARIABLE-GEOMETRY AIRCRAFT	206
<i>P V Kruglov, V I Kolpakov</i>	
EVALUATION OF THE EFFECTIVENESS OF THE INTRODUCTION OF A DISCRETE FILLER IN THE ALUMINUM MATRIX MELT	211
<i>Yu A Kurganova, Yijin Chen, S P Shcherbakov</i>	
ELECTRIC TREATMENT OF ALUMINA COMPOSITE MATERIALS	216
<i>G N Minenko, S L Timchenko</i>	
STRESS-STRAIN STATE OF THE INTERFACIAL LAYER IN A VISCO-COMPOSITE COMPOSITE WITH LONGITUDINAL SHEAR	222
<i>A A Dudchenko, S A Lurie, S V Makovskij, K K Shramko</i>	
DUAL-CURING PROPARGYL/PHTHALONITRILE MONOMERS FOR COMPOSITES BY VACUUM INFUSION PROCESS	238
<i>S S Nechausov, A.P. Malakho, B A Bulgakov</i>	
MODERN APPROACHES TO THE MANUFACTURE OF CERAMIC-MATRIX COMPOSITE MATERIALS FOR LONG-TERM OPERATION AT TEMPERATURES ABOVE 1000°C. REVIEW OF WORLD EXPERIENCE AND CAPABILITIES OF JSC "KOMPOZIT"	246
<i>P A Timofeev, I A Timofeev, E A Bogachev, A N Timofeev</i>	
INFLUENCE OF REFRACTORY NANOSIZED PARTICLES OF TUNGSTEN CARBIDE AND TITANIUM ON THE STRUCTURE AND PROPERTIES OF THE WELD METAL	251
<i>A S Pankratov, N V Kobernik, A V Samokhin</i>	
SILICON NITRIDE-BASED CERAMIC COMPOSITE MATERIALS FOR CORROSION-RESISTANT ROLLING BEARINGS	258
<i>S A Pakhomova, A I Povalyayev</i>	
CONSTITUTIVE RELATIONS OF THE ENDOCHRONIC THEORY OF THERMOPLASTICITY FOR HIGH-TEMPERATURE COMPOSITES UNDER PLANE STRESS STATE	263
<i>B S Sarbayev</i>	
COMPARATIVE ANALYSIS OF AVERAGING METHODS FOR OBTAINING COMPOSITE MATERIAL ELASTIC CHARACTERISTICS	270
<i>V S Zarubin, E S Sergeeva, I V Magnitsky</i>	
ULTRA-JET DIAGNOSTICS OF FUNCTIONAL-LATENT FACTORS OF COMPOSITE MATERIALS	276
<i>A A Barzov, A L Galinovski, V A Belov</i>	
CHANGE IN THE STRUCTURE OF THE ALUMINIUM ALLOY UNDER THE ACTION OF DIRECT ELECTRIC CURRENT	284
<i>S L Timchenko, N A Zadorozhnyj</i>	

APPLICATION OF A NEW METHOD OF NON-ADHESION DEFECT SIMULATION IN MULTILAYER HONEYCOMB STRUCTURES FROM POLYMER COMPOSITE MATERIALS FOR VARIOUS NONDESTRUCTIVE TESTING METHODS	291
<i>D Rusakov, V Chernushin</i>	
IMPACT TOUGHNESS OF MULTILAYER STEEL MATERIALS AT LOW TEMPERATURES	295
<i>D V Vlasova, A I Plokhikh</i>	
STUDY OF THERMAL EXPANSION ANOMALIES OF MULTILAYER STEEL MATERIALS AT HIGH TEMPERATURES.....	299
<i>V E Kabantseva, M D Safonov, A I Plokhikh</i>	
STUDY OF THE PROCESS OF NITRIDING IN MULTILAYER MATERIALS BASED ON STEEL.....	305
<i>K B Polikevich, A I Plokhikh</i>	
DEVELOPMENT OF A NEW EXPERIMENTAL METHOD FOR THE DETERMINATION OF INPLANE SHEAR STRENGTH AND ELASTIC CHARACTERISTICS OF POLYMER COMPOSITE MATERIALS BASED ON HIGHMODULUS CARBON FIBER-REINFORCED PLASTICS HAVING THE $\pm 45^\circ$ PLIES.....	309
<i>Nikolai Matyushevsky, Alexei Popov</i>	
SURFACE EXPRESS ULTRAJET DIAGNOSTICS OF SPACE VEHICLE MATERIALS.....	313
<i>A L Galinovsky, D R Mugla, E S Golubev</i>	
POLYMER COMPOSITES BASED ON HALOGEN-CONTAINING OLIGOETHERS.....	319
<i>R Ch Bazheva, A S Borodulin, A N Kalinnikov, A M Charaev</i>	
IMPROVING THE FIRE RESISTANCE OF PVC PLASTIC THE INTRODUCTION AMMONIUM OCTAMOLYBDATE.....	327
<i>T A Borukaev, A M Kharaev, A Kh Shaov, A S Borodulin, A N Kalinnikov</i>	
INVESTIGATION OF THE SCALE FACTOR AND DEFORMATION FEATURES DURING COMPRESSION OF A SPATIALLY REINFORCED CARBON COMPOSITE MATERIAL	333
<i>K A Ponomarev, I V Magnitskiy</i>	
TECHNOLOGY OF APPLYING ANTIFRICTION COATINGS USING AN ELECTRIC ARC PULSATING POWER.....	338
<i>I N Kravchenko, D I Petrovsky, M A Glinsky</i>	
ENGINEERING AND TECHNOLOGICAL METHODS OF ULTRA-JET DIAGNOSTICS OF COMPLEX-PROFILED PRODUCTS MADE OF COMPOSITE MATERIALS.....	344
<i>A A Barzov, V A Belov, A L Galinovsky, I V Mazaeva</i>	
METALLURGY OF THIXOTROPIC MATERIALS: THE EXPERIENCE OF ORGANIZING THE PROCESSING OF STRUCTURAL MATERIALS IN ENGINEERING THIXO AND MIM METHODS.....	346
<i>A B Semenov, A A Kutsbakh, A N Muranov, B I Semenov</i>	
DEVELOPMENT OF MEDICAL MATERIAL BASED ON NICKEL-TITANIUM.....	352
<i>R S Fakhurtdinov, I M Fedjuk, E O Nasakina</i>	
DESIGN AND PROCESS FOR PRODUCTION OF SPACECRAFT STRUCTURES USING RADIAL BRAIDING AND TRANSFER MOLDING.....	358
<i>V I Khaliulin, V V Batrakov, V V Savitskiy</i>	

SOL-GEL SYNTHESIS OF OXIDE PROTECTIVE COATINGS OF CARBON FIBERS TO INCREASE HEAT RESISTANCE IN AGGRESSIVE OXIDIZING ENVIRONMENTS	366
<i>A A Tselovalnikova, D A Trubin, A N Karandashev</i>	
MICROPOROUS PVDF IONIC MEMBRANES FOR ACTUATOR APPLICATIONS PREPARED WITH IMIDAZOLE-BASED POLY(IONIC) LIQUID AS A PORE FORMING MATERIAL	371
<i>O S Morozov, S S Shachneva, A V Kepman</i>	
TOPOLOGY OPTIMIZATION OF THE LATTICE PAYLOAD ADAPTER FOR CARRIER ROCKET	379
<i>R S Baldzhiev, A A Alekseyev, A V Azarov</i>	
DEVELOPMENT OF THE RADIANT HEATING FACILITIES FOR THE TESTING OF CERAMIC MATERIALS WITH OPERATING TEMPERATURES UP TO 2000 K	386
<i>R S Baldzhiev, P V Prosuntsov, M O Zabezhailov</i>	
STUDY OF THE GTE STATOR VANE SAMPLES MADE FROM A AL-SIC METAL MATRIX COMPOSITE REINFORCED BY SIC	394
<i>V V Berezovskiy, J A Kurganova</i>	
ESTIMATION OF THE EFFECTIVE ELASTIC CHARACTERISTICS OF CARBON COMPOSITE MATERIALS BY TESTING RING-SHAPED SAMPLES UNDER HIGH TEMPERATURES	399
<i>K A Ponomarev</i>	
OPTIMIZATION OF CURING MODE OF EPOXY RESIN BASED COMPOSITES	406
<i>Yangyang Chen, G Malysheva</i>	
DESIGN CALCULATION OF BRAIDED HIGH-TEMPERATURE COMPOSITE STRUCTURES	412
<i>A A Smerdov</i>	
HYBRID COMPOSITES IN REUSABLE SPACE VEHICLES WING STRUCTURES	419
<i>E R Ashikhmina, T G Ageyeva, P V Prosuntsov</i>	
DEVELOPMENT OF BRANCHED AROMATIC MALEIMIDES AS COMPONENTS OF SELF-HEALING BINDERS FOR POLYMER COMPOSITES	425
<i>N.V. Karelina, V I Solodilov, A.V. Polezhaev</i>	
THE USE OF INFLATABLE STRUCTURES FOR THE REMOVAL OF SPACECRAFT FROM ORBIT	432
<i>V V Koryanov, A G Toporkov, V P Kazakovtsev, A A Nedogarak, E K Gnezdova</i>	
FURFURYLGLYCIDYL ETHER: A NEW EFFECTIVE ACTIVE DILUENT FOR EPOXY RESINS FROM BIO-RENEWABLE RAW MATERIALS	440
<i>T V Petrova, V I Solodilov, V E Kabantseva, N V Karelina, A V Polezhaev</i>	
THE EFFECT OF TRIETHYLENE GLYCOL ADDITIVE ON THE SELF-HEALING PROPERTIES OF EPOXY BINDER	446
<i>T V Petrova, V I Solodilov, V E Kabantseva, N V Karelina, A V Polezhaev</i>	
MODIFIED OIL BITUMEN	454
<i>L V Fedorova, Z O Tretyakova, M V Voronina</i>	

INFLUENCE OF AGGRESSIVE ENVIRONMENT ON BASALT FIBER BASED MICROPLASTICS	457
<i>R A Korokhin, V I Solodilov, A V Kireinov, M A Orlov</i>	
NEWER APPROACHES TO THE CREATION OF THE THERMOSTABLE SPACE PLATFORMS FOR THE EARTH REMOTE SOUNDING.....	463
<i>M A Gorodetsky, K V Mikhaylovsky, S V Reznik</i>	
ACTIVE THERMOGRAPHY AS A CONTEMPORARY METHOD FOR ENSURING THE QUALITY OF COMPOSITE MATERIAL PRODUCTS	470
<i>I O Kotovshchikov</i>	
METALLIC COATING TECHNOLOGIES FOR CARBON FABRICS AND METHODS FOR ASSESSING THEIR QUALITY	477
<i>V A Nelyub</i>	
METAL-COATED CARBON FIBER MODEL	485
<i>V A Nelyub, A A Bocharov</i>	
ABOUT THE MECHANISMS OF FIBRE REINFORCED PLASTIC BEHAVIOUR UNDER CYCLING LOADING	489
<i>V N Paimushin, R A Kayumov, S A Kholmogorov</i>	
LAYERED NANOSTRUCTURED COMPOSITES WITH SELF-HEALING EFFECT BASED ON PLASTIC BOROSILOXANE MATRICES	495
<i>N N Sitnikov, I A Khabibullina, V I Mashchenko</i>	
NUMERICAL CALCULATION OF THE STRESS-STRAIN STATE OF PIEZOELECTRIC LAYERED POLYMER COMPOSITE MATERIALS EQUIPPED WITH A CONTROL PIEZOACTUATOR.....	502
<i>A N Anoshkin, P V Pisarev, A A Pan'kov, V A Ashikhmin</i>	
STUDY OF THE EFFECT OF PERMEABILITY COEFFICIENTS IN A THREEDIMENSIONAL FORMULATION FOR FABRICS VARIOUS TYPES OF FABRIC STRUCTURES	509
<i>Pyi Phyo Maung, G. Malysheva</i>	
RELATED PROBLEMS OF DESIGNING HEAT-LOADED STRUCTURES FROM CERAMIC MATRIX	514
<i>A D Ezhov, L V Bykov, N V Artemchuk</i>	
CREATION AND ANALYSIS OF HYBRID NANOCOMPOSITES BASED ON DIOXIDINE AND NANOPARTICLES OF BIOACTIVE METALS EMBEDDED IN CRYOSTRUCTURATED GELATIN MATRICES	525
<i>A V Nuzhdina, T I Shabatina, O I Vernaya, V P Shabatin</i>	
SIMULATION OF PARTICLE SIZE DISTRIBUTION OF MECHANOCHEMICALLY ACTIVATED CHARGES OF AL-SIC COMPOSITE MATERIALS.....	533
<i>S N Sergeenko</i>	
THE EFFECT OF CURING TEMPERATURE ON PHASE SEPARATION, MORPHOLOGY, FRACTURE TOUGHNESS AND IMPACT RESISTANCE OF EPOXY-POLYSULFONE BLENDS AND FIBER REINFORCED PLASTICS BASED ON THEM	540
<i>V I Solodilov, A V Shapagin, R A Korokhin, Yu A Gorbatkina</i>	
INCREASE OF COMPOSITE STRUCTURES STRENGTH BY CARBON FIBER SURFACE MODIFICATION WITH SPRAY DEPOSITED CARBON NANOTUBES	548
<i>D D Levin, A V Romashkin, Yu A Polikarpov, N S Struchkov, A V Kireynov, I A Komarov</i>	

DEVELOPMENT OF CARBON/EPOXY COMPOSITE BRACKET FOR HOUSING SENSITIVE ELEMENT OF SPACECRAFT	552
<i>V A Komarov, A A Pavlov, S A Pavlova</i>	
FABRICATION OF SAMPLES AND STUDY ON MECHANICAL PROPERTIES OF METAL MATRIX COMPOSITES WITH SYSTEM "AL-NANOAL ₂ O ₃ "	557
<i>Y Chen, Yu A Kurganova, S P Shcherbakov, V K Gaaze</i>	
STUDYING THE STRUCTURE OF PRODUCTS MADE OF TITANIUM CARBIDE HARDENED BY THE IMPREGNATION METHOD.....	560
<i>V Yu Kulikov, Sv S Kvon</i>	
TRANSPORT PROPERTIES OF CERAMIC COMPOSITES BASED ON BISMUTH AND INDIUM OXIDES	566
<i>P E Dergacheva, I V Kulbakin, S V Fedorov</i>	
MULTISCALE MODELING OF DEFORMATION AND DAMAGE OF ELASTICPLASTIC PARTICLE REINFORCED COMPOSITES	571
<i>Yu I Dimitrienko, Yu V Yurin, S V Sborschikov</i>	
ANALYSIS OF ANISOTROPY OF TIME-DEPENDENT AND NONLINEAR PROPERTIES OF UNIDIRECTIONAL CFRP	577
<i>A M Dumansky, Hao Liu</i>	
INVESTIGATION OF MECHANICAL CHARACTERISTICS OF A CARBONCERAMIC COMPOSITE MATERIAL BASED ON A BRAIDED PREFORM	584
<i>A N Baryshev, G G Kulish, A A Smerdov, I A Timofeev, C V Tsvetkov</i>	
STRUCTURE AND PROPERTIES OF THE COMPOSITE MATERIAL BASED ON HEAT-RESISTING VKNA-4U ALLOY WITH OXIDE STIFFENING FILLERS, DESIGNED FOR ADDITIVE MANUFACTURING TECHNOLOGIES OF POWER FASTENERS FOR GAS TURBINE ENGINES (GTE)	591
<i>M V Unchikova, A I Rodionov, N A Golovlev</i>	

Author Index