

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ДВНЗ «Прикарпатський національний університет імені Василя Стефаника»

Кафедра фізики і хімії твердого тіла

Фізико-хімічний інститут

Навчально-дослідний центр напівпровідникового матеріалознавства

АКАДЕМІЯ НАУК ВИЩОЇ ШКОЛИ УКРАЇНИ

НАЦІОНАЛЬНА АКАДЕМІЯ НАУК УКРАЇНИ

Інститут фізики напівпровідників ім. В.Є. Лашкарьова

Інститут хімії поверхні ім. О.О. Чуйка

Інститут металофізики ім. Г.В. Курдюмова

Інститут загальної і неорганічної хімії ім. В.І. Вернадського

Українське фізичне товариство

Інститут інноваційних досліджень (Івано-Франківськ, Україна)

Університет Цзілінь (Чанчунь, Китай)

**XVII МІЖНАРОДНА ФРЕЙКІВСЬКА КОНФЕРЕНЦІЯ З ФІЗИКИ І
ТЕХНОЛОГІЇ ТОНКИХ ПЛІВОК ТА НАНОСИСТЕМ**

Збірник тез

Івано-Франківськ, 20-25 травня, 2019

Ivano-Frankivsk, May 20-25, 2019

Abstract book

**XVII INTERNATIONAL FREIK CONFERENCE ON PHYSICS AND
TECHNOLOGY OF THIN FILMS AND NANOSYSTEMS**

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

Vasyl Stefanyk Precarpathian National University

Physics and Chemistry of Solids Department

Physical-Chemical Institute

Educational Research Centre for Semiconductor Material

ACADEMY OF SCIENCE OF HIGH SCHOOL OF UKRAINE

NATIONAL ACADEMY OF SCIENCE OF UKRAINE

V.E. Lashkarev Institute of Semiconductor Physics

Chuiko Institute of Surface Chemistry

G.V. Kurdyumov Institute of the Physics of Metals

V.I. Vernadsky Institute of General and Inorganic Chemistry

Ukraine Physics Society

Institute of Innovation Research (Ivano-Frankivsk, Ukraine)

Jilin University (Changchun, P. R. China)

УДК 539.2

ББК 22.373.1

П 80

XVII Міжнародна Фреїківська конференція з фізики і технології тонких плівок та наносистем. Збірник тез. / За заг. ред. проф. В.В. Прокопів. Івано-Франківськ : Видавництво Прикарпатського національного університету імені Василя Стефаника, 2019. 376 с.

Представлено сучасні результати теоретичних і експериментальних досліджень з питань фізики і технології тонких плівок та наносистем: метали, напівпровідники, діелектрики, провідні полімери; методи отримання та дослідження; фізико-хімічні властивості; нанотехнології і наноматеріали, квантово-розмірні структури, наноелектроніка, тощо. Матеріали підготовлено до друку Програмним комітетом конференції і подано в авторській редакції.

Для наукових та інженерних працівників, що займаються проблемами тонкоплівкового матеріалознавства, мікро- та наноелектроніки.

Рекомендовано до друку науково-технічною радою Фізико-хімічного інституту ДВНЗ «Прикарпатський національний університет імені Василя Стефаника»

XVII International Freik Conference Physics and Technology of Thin Films and Nanosystems. Abstract book. / Ed. by Prof. V.V. Prokopiv. Ivano-Frankivsk : Publisher Vasyl Stefanyk Precarpathian National University, 2019. 376 с.

The results of theoretical and experimental researches in directions of the physics and technology of thin films and nanosystems: metals, semiconductors, dielectrics, and polymers; and methods of their investigation; physic-chemical properties of thin films; nanotechnology and nanomaterials, quantum-size structures; thin-film devices of electronics, are presented. The materials preformed for printing by Conference's Organizational Committee and Editorial Board, are conveyed in authoring edition.

For scientists and reserchers on the field of thin-film material sciences, micro- and nanoelectronics.

©ДВНЗ «Прикарпатський національний університет імені Василя Стефаника», 2019

© Vasyl Stefanyk Precarpathian National University, 2019

PROGRAM COMMITTEE / EDITORIAL BOARD

Editor-in-Chief

Prof. Volodymyr PROKOPIV

Vasyl Stefanyk Precarpathian National University (Ivano-Frankivsk, Ukraine)

Vice Editors-in-Chief

Acad. Volodymyr LITOVCHENKO

V.E. Lashkarev Institute of Semiconductors Physics, NAS in Ukraine (Kyiv, Ukraine)

Prof. Andriy ZAGORODNYUK

Vasyl Stefanyk Precarpathian National University (Ivano-Frankivsk, Ukraine)

Program Committee

Prof. Juozas AUGUTIS (*Kaunas, Lithuania*); Prof. Mahammad BABANLY (*Baku, Azerbaijan*); Prof. Slavko BERNIK (*Ljubljana, Slovenia*); Prof. Attila CSÍK (*Debrecen, Hungary*); Prof. Petro FOCHUK (*Chernivtsy, Ukraine*); Prof. Bruce GNADE (*Dallas, USA*); Prof. Gaetano GRANOZZI (*Padova, Italia*); Prof. Yuri GUREVICH (*Mexico City, Mexico*); Prof. Eugeny IVAKIN (*Minsk, Belarus*); Acad. Orest IVASISHIN (*Kyiv, Ukraine*); Prof. Zhao HUI (*Harbin, P.R. China*); Prof. Ivan KABAN (*Dresden, Germany*); Acad. Vasyl KLADKO (*Kyiv, Ukraine*); Prof. Sandor KÖKÉNYESI (*Debrecen, Hungary*); Dr. Petro LYTVYN (*Kyiv, Ukraine*); Prof. Bingbing LIU (*Changchun, P. R. China*); Prof. Georgy MALASHKEVICH (*Minsk, Belarus*); Prof. Georgy MLADENOV (*Sofia, Bulgaria*); Acad. Anton NAUMOVETS (*Kyiv, Ukraine*); Dr. Andriy NYCH (*Kyiv, Ukraine*); Prof. Ivan PROTSENKO (*Sumy, Ukraine*); Prof. Olena ROGACHEVA (*Kharkiv, Ukraine*); Prof. Eduard SHPILEVSKY (*Minsk, Belarus*); Dr. Petro SMERTENKO (*Kyiv, Ukraine*); Prof. John STOCKHOLM (*Vernouillet, France*); Prof. Tomasz STORY (*Warsaw, Poland*); Dr. Zbigniew SWIATEK (*Krakow, Poland*); Acad. Ion TIGINYANU (*Chisinau, Moldova*); Prof. Arnolds ŪBELIS (*Riga, Latvia*); Prof. Grzegorz WISZ (*Rzeszow, Poland*); Prof. Krzysztof WOJCIECHOWSKI (*Kraków, Poland*); Prof. Paweł ŻUKOWSKI (*Lublin, Poland*)



PLENARY SESSIONS



Application of the Project Method in the Educational Process of the Modern School

Shkurenko Olexandra

Kyiv Boris Hrinchenko University, Kyiv, Ukraine, aleksandritta7@gmail.com

The educational project is one of the personality-oriented technologies, a method of organizing students' independent activity, which is aimed at addressing the problem of an educational project, which integrates a problem approach, group methods, reflection, research, search and other techniques [6, P. 102].

During the Project term, the students' autonomy, active stance, initiative and enthusiasm are of paramount importance. Projects can be personal, group or collective.

The purpose of educational design is to enable the teacher to create such conditions during the educational process under which its result is personal experience of the student's project activities.

The ability to use the project technology is indicative of the teacher's high professional skill, his/ her innovative thinking, orientation towards the personal and professional development of the child in the learning process.

As a result of the project, we will obtain both the external result that can be seen, interpreted, applied in practice (presentations, posters, textbooks, memos, etc.) and the internal result, that is, experience including knowledge, skills, competences and values.

The systematic introduction of the project technology at school level (from the elementary level) leads students to gradually mathe ability to study independently, to think critically, but also as a method of organizing and planning his/her subsequent life. This helps train young people who are guided by democratic values in their activities, are inclined to engage in lifelong learning, can compete in the European and world educational space and labor market.

Project activity is a rather promising component of the educational process, as it creates proper conditions for students' creative self-development and self-realization, forms all necessary vital competencies, which at the Council of Europe were defined as the main ones in the XXI century, such as multicultural, linguistic, informational, political and social ones. Independent acquisition and systematization of knowledge, the ability to navigate the information space, to see the problem and make a decision have been made possible as a result of the application of the project method.

Using the project method allows students to acquire communication, theoretical and practical skills and to get an idea of different views of the problem. In so doing students learn how to use research methods to obtain information and to work on their own and in groups, to listen to the opinions of others and to develop productive way of thinking.

1. Pedagogical Technologies in Continuing Education / Edited by S.O.Sysoyeva - K., 2001. - 244 pp.

AUTHORS INDEX

- Abashkin V. 217
Achimova E. 17, 217
Afanasieva T.V. 40
Akinshau K. 177, 204
Aksimentyeva O.I. 91, 144
Aleksandrov M.A. 214, 215
Alekseev O.M. 41
Alekseeva T.T. 348
Alieksandrov M.A. 178
Aoki Toru 5
Avksentyeva L.V. 97
Baibara A.E. 179
Bairachniy B.I. 35
Balabai R. M. 92, 93, 297
Balovsyak S. 161, 298, 332
Bandura Kh. 49, 183
Barabash M.Yu. 121, 137, 139
Baran J. 115
Baran N.P. 211
Barbash V.A. 41
Bardashevskaya S.D. 180
Barlas T.R. 289
Barsukov V.Z. 343
Bashev V.F. 56, 259
Bazylyak L.I. 205
Bechkhalo Kh.B. 103
Bekenev V.L. 107
Beketov G.V. 258
Belous A.G. 123
Benko T.H. 283, 284
Bereznyak Yu. 299
Berezovskaya N.I. 251
Berezovsky M.M. 159
Bester M. 346
Bezdidko O.V. 277
Bezruka N.A. 58
Bihun R.I. 22
Biletsky Y.S. 317
Bilogorodskyy Y.S. 61
Bilozeretseva V. 181
Bilynskyy I. 42
Blahun N.M. 363
Bloshenko Z.V. 88
Boev V. 95
Bogatyrenko S. 78, 85
Bogatyrev V.M. 144
Bogdanov Yu.S. 36
Bohdan R. 160
Boichuk A.M. 182
Boichuk T.Ya. 182
Boichuk V. 49, 183, 195
Bokshyts Yu.V. 108
Bolshakova I. 278
Boltovets P.M. 184
Borcha M. 102, 298, 332
Bordun B.O. 141
Bordun O.M. 141
Borisova S.S. 36
Borkovska L. 300, 364
Borschagovsky E.G. 269
Borshch O.B. 294
Borshch V.V. 294
Borysiuk V. 185
Bovgyra O.V. 64, 287
Bovhyra R.V. 28
Bovsunivskiy O.V. 301
Boyko V.V. 41, 305, 334
Bozhko V.V. 116, 253
Brovko O. 342, 347
Brus V.V. 255
Brytan V.B. 103
Bryzhko V.S. 60
Bubniene Urte 67
Budnik A.V. 19
Budzhak Ya.S. 43, 302
Budzulyak I.M. 53, 180, 195, 220
Budzulyak S. I. 50, 180, 186
Bugaiova M.E. 179
Bulaniy M.F. 55
Bulatetska L.V. 116
Bulatetsky V.V. 116
Bulgakova O.O. 88

- Burchenia A.V. 303
Burdiak V.R. 271
 Burlak G.M. 270
 Buryy O. 293
 Bushkova V.S. 216
 Bushma A.V. 279
 Busko T.O. 214, 215, 218
 Butenko D.S. 76
 Butsen Andrei 344
 Buzhdyhan Kh.V. 356
 Carr P. 146
 Charny D.V. 214, 215
 Chayka M.V. 142
Cherkach K.P. 317
 Chernenko V.V. 119
 Chernikova O.M. 79, 366
 Chervinko D.V. 182
 Cheshko I. 33, 277
 Chopyk P.Ya. 225
 Chornii V.P. 41, 304, 334
 Chukova O.V. 143
 Chumak Mykola 126
 Chumak V.V. 304
 Churilov I.G. 80
 Cieniek B. 345
 Csik A. 29, 201
 Dan'kiv O.O. 60
 Danko V.A. 194
 Danylchuk S.P. 305
 Danyiuk N. 59
 Demianenko E.M. 52
 Demkiv O. 95
 Denysyuk R.O. 142
 Diakonenko N. 181
 Dmitrenko O.P. 214, 215
 Dmitriev A.I. 179
 Dmytrenko O.P. 178, 218
 Dmytriv A.M. 351
 Dmytrotsa T.V. 58
 Dmytruk I.N. 251
 Dmytruk O.V. 223
 Dobrozhan A.I. 96
 Dolishnyak O.I. 286
 Domantsevich N.I. 237, 238
 Doroshenko A.N. 113, 363
 Dovganyuk V. 245
 Dovhopyaty Yu. 316
 Dovhyi V.V. 283
 Dranenko A.S. 239
 Dremlyuzhenko K.S. 50
 Dremlyuzhenko S.G. 338
 Drozdov A.N. 282
 Druzhinin A.O. 43
 Druzhinin A.A. 302
 Dubikovskiy O.V. 38
 Dudka O.I. 75
 Duffy R. 210
 Dukarov S.V. 80, 81, 88, 240
 Durkot M.O. 20, 266
 Dusheiko M.G. 14, 97
 Dvernikov B.F. 119, 124
 Dzeryn M.R. 144
 Dzhagan V. 31, 50, 194
 Dziedzic A. 345
 Dzikovskyi V.Ye. 287
 Dzumedzey R.O. 268
 Dzundza B.S. 241, 256, 286, 355
 Efremov A.A. 145, 158
 Ermakov V.M. 186
 Evstigneev M. 124
Fedelesh V.I. 12
 Fediv V.I. 48
 Fedorenko L.L. 94
 Fedorenko V.O. 73
 Fedorenkova L.I. 187
Fedoriv V.D. 272
 Fedorus A.G. 40
 Fedosov S.A. 223, 305, 307, 322
 Fedosov S.N. 146, 147, 261, 262
 Filonenko D.S. 121
 Filonenko O. 188
 Fochuk P.M. 171, 312, 313, 331, 338
 Fodchuk I. 6, 102, 245, 306, 332
 Forostyana N.P. 352
 Franiv A.I. 65
 Franiv A.V. 287

- Franiv I.A. 64
 Franiv V.A. 65
 Frugynskyi M. S. 345
 Futey O.V. 64
 Gab A.I. 148, 242
 Gab I.I. 243
 Gabrelian B.V. 107
 Gaidar G.P. 44, 45
 Gal' Yu.M. 225
 Galan I. 193
 Galiy P.V. 189
 Garpul O.Z. 353
 Gasinets S.M. 308
Gasyuk I.M. 182, 244
 Gatilov S.E. 186
 Gavrilko T.A. 63
 Gentsar P.O. 190, 309
 Giacometti J.A. 147
 Glotov V.I. 210
 Głowa Ł. 346
 Gnatyuk V. 5
 Gnilitskyi I. 365
 Gomeniuk Yu.V. 210, 269
 Gonchar M. 95
 Gorbulik V.I. 14
 Gorskyi P.V. 46
 Grabko T.V. 182
 Grebenyuk A.G. 228
 Grinevich R.V. 17
 Gromovyi Yu. 172
 Gromyko O.M. 73
 Grushka O.G. 255
 Gryga V.M. 284
 Gryshchouk G.V. 73
 Grytsenko K. 191
 Guba S. 193, 279
 Gudymenko O. 6, 245, 300
 Guillaume C. 83
 Gule E.G. 48
 Gun'ko V.M. 58
 Guranich P.P. 308
 Gutiv V.V. 68
 Gutsuliak I. 6, 245
 Halushchak M.O. 193, 278
 Halyan V.V. 310
 Hamamda S. 41
 Han W. 76
 Hatilov S.E. 50
 Havryliuk Ye. 31
 Himics L. 166
 Hizhnyi Yu. 185
 Hladun Tetiana 128
 Hmaruk G. P. 311
Hodlevska M.A. 183
 Holomb R. 166, 201
 Holota V.I. 284
 Honchar F. 324
 Horbatenko O. 342
 Horbenko Yu. Yu. 144, 149
 Horichok I.V. 104, 110
 Horvat Yu.A. 20, 266
 Horyn A.M. 327
 Hotsuliak K. 354
 Hreb V.M. 62, 74
 Hreida N.V. 321
 Hreshchuk O.M. 194, 308
 Hurskyy S.T. 74
 Iarova N. 343, 347
 Ievtukh V.A. 280
 Ilashchuk M.I. 255
 Ilcheva V. 95
 Ilchuk H.A. 330
 Ilin S. 364
 Ilkiv B. 162
 Isaev M.V. 190
 Isaieva O. F. 48, 234
 Ivakhnenko S. O. 303, 315
 Ivakin E. 32
 Ivanenko K.O. 41
 Ivanits'ka V.G. 312
 Ivaschenko V.I. 100
 Ivashchenko I.A. 310
 Kaban I. 106, 115
 Kachkovsky O.D. 218
 Kachmar A. 49, 195
 Kalashnyk Yu.Yu. 196

- Kalinina T.V. 156
 Kalychak Ya.M. 73
 Kalytchuk S. 234
 Kanak A.I. 313
 Kapush O.A. 50, 186
 Kapustianyk V.B. 230
 Karachevtseva L. 150, 197, 281, 290
 Karandas Ya.V. 51
 Karas' M.I. 150, 197, 281, 290
 Karpenko O.S. 52
 Karpets M.V. 75
 Kasatkin V.P. 97
 Kase Hiroki 5
 Kasetaitė S. 95
 Kashuba A. 60, 324, 330
Katanova L.O. 244
 Katashinski A.S. 343
 Kavetsky T. 95, 115
 Kazemirskyi T. 6, 298
 Kernazhitsky L.A. 63
 Kevshyn A. 311, 314
 Kharchenko M.F. 206
Khatsevich O.M. 70
 Khatsevych O. 49
 Khemii O.M. 53
 Khemii M.M. 53
 Khmelenko O.V. 55, 105
 Kholevchuk V.V. 26
 Khomenkova L. 83, 211, 300
 Khottchenkova T.G. 108
 Khovavko A.I. 121
 Khramova T.I. 113
 Khrypunov G.S. 9, 10, 96
 Khrypunov M.G. 9, 282
 Khrypunova A.L. 81, 282
 Khrypunova I.V. 81
 Khshanovska O.I. 110
 Khyzhun O.Y. 107, 280
 Kidalov V. 217
 Kinzerska O.V. 159
 Kirichenko M.V. 81
 Kiris Vasilii 344
 Kisialiou I. 32
 Kisselyuk M.P. 295
 Kityk I.V. 339
 Kivgilo V. 129
 Kladko V. 6, 102, 245, 300
 Klanichka V.M. 246, 247
 Klanichka Y.V. 246, 247
 Klepikova K.S. 81
 Kleto G.I. 171
 Klimovskaya A.I. 196
 Klochko N.P. 81
 Klymov O.V. 151
 Klyui N.I. 11, 14, 76, 97
 Knoff W. 179
 Kobylanska S.D. 123
 Kogut I.T. 283, 284, 285
 Koike Akifumi 5
 Kokenyesi S. 160
 Kolesnichenko A.A. 137, 139
 Kolisnik M.G. 338
 Kolkovska H.M. 198
 Kolkovskyi P.I. 198
 Kolupaev B.B. 200
 Kolupaev B.S. 199
 Kolupaieva Z.I. 35
 Kolyadina E.Yu. 26
 Kondrat O. 201
Kondratenko O.S. 120, 289
 Kondratenko S.V. 120, 143
 Kondratenko V.V. 36
 Konevych O.P. 110
 Kononenko Ya.A. 75
 Konopelnyk O. I. 366
 Konstantinovich A.V. 248
 Konstantinovich I.A. 248
 Kopach G.I. 96
 Kopach V.R. 81
 Kopeliovich A.I. 202
 Kopylets I.A. 36
 Korbutyak D.V. 50, 94, 186
 Korchovyi A. 217
 Korkishko R.M. 119
 Kornyushchenko A.S. 203
 Kornyushchenko G.S. 152

- Korolyshyn A.V. 213
 Korotun A.V. 51, 54
 Korovytsky A.M. 318
 Korsunskaya N. 83, 211, 364
 Koshel V.I. 355
 Koshelev M.V. 239
 Kosinov O.H. 186
 Kosminska Yu.O. 152, 203
 Kost Ya. 193, 278
 Kostiuk D.M. 277
 Kostylyov V.P. 119, 123, 124, 269
 Kostyuk B.D. 243
 Kostyuk O.B. 244, 286
 Kostyukevich S.O. 166
 Kosulya O.V. 38
 Kosynska O.L. 153
 Kot Y.O. 367
 Kotova N.V. 120, 289
 Kotsyubynskiy A. 245
 Kotsyubynsky V. 49, 183, 195
 Kotyk M.V. 285
 Kouhar V. 204
 Koval Yu.V. 207, 307, 311, 322
 Koval' A.O. 54
 Kovalenko A.V. 55, 105
 Kovalenko M.V. 287
 Kovalenko T. V. 315
 Kovtun N.A. 9
 Kozak A.O. 100
Kozak M.I. 12
 Kozlovskiy A.A. 260
 Kramar O. 316
 Kravets I.V. 356
 Kravtsov P.O. 240
 Krayovskyy V.Ya. 327
 Krivoruchko Ya.S. 69
 Kropachek O.Y. 96
 Kruk A. 78
 Krushynskaya L.A. 179
 Kryshchal A. 78, 85
 Kryuchyn A. 166, 191
 Kryvoruchko M.Y. 352
 Ksianzou V. 191
 Kublanovsky V.S. 148, 274
 Kudii D.A. 9, 282
 Kudiy D.A. 151
 Kudryk Ya.Ya. 294
 Kugai N.A. 156
 Kukharskyy I.Yo. 141
 Kukhazh Y. 95
 Kulchytsky B.N. 186
 Kulish M.P. 178, 214, 215
 Kunak S. 263
 Kurbatov D.I. 151
 Kurchak A.I. 13
 Kurek I.G. 250, 258
 Kurochka L.I. 214
 Kurta S.A. 70
 Kuryliuk A.M. 347
 Kuryshchuk S.I. 291
 Kushnerov O.I. 56, 259
 Kushneryk L.Ya. 99
 Kuts V. 188
 Kutseva N.A. 259
 Kuzmin A. 6, 245, 298, 332
 Kuzyk O.V. 60
 Kuzyshyn O.V. 356
 Kyrylenko V.K. 20, 266
 Kysil D.V. 234, 269
 Kytsya A.R. 205
 Labbe C. 300
 Lashkarev G. V. 179
 Lavrenova T.I. 57
 Lavrentyev A.A. 107
 Leone Edgar 25
 Lepikh Ya.I. 57
 Leshko R. 41
 Lesiuk A.I. 218
 Levchuk I.V. 314
 Levchuk V.V. 199
 Levytsky S.M. 310
 Lischuk P.O. 190
 Lishchynskyy I.M. 106, 135
 Lisovsky R.P. 220
 Litovchenko V.G. 94, 119
 Litvin R.V. 197, 139

- Liubchenko O. 102
 Lobanov V. 52, 69, 188, 228
 Lohvynov A. 33
 Lopatynskiy I.Ye. 346
 Lopyanko M.A. 34, 154, 249
 Lotarev S. 204
Loya V.Yu. 12
 Lozinskii V.B. 14, 97
 Lubov D.V. 260
 Luchytskyi R.M. 212
 Lukianov A.M. 14, 97
 Lukienko I.M. 206
Lukyanchuk I. 15
 Luniov S.V. 207
Lunko T.S. 120
 Lutsiuk I.V. 74
 Lutsyk N.Yu. 155
 Lutsyshyn V.M. 357
 Luzhnyi I. 107
 Lyapina A. 172
 Lyashuk T.G. 199
 Lyeshchuk O.O. 301
Lysak A.V. 318
 Lysakovskii V.V. 301, 303, 316, 334
 Lysenko A.B. 156
 Lysenko V.S. 234
 Lysiuk O.V. 250
 Lytvyn O.S. 158
 Lytvyn P. 20, 145, 158, 191, 194, 196, 245
 Lytvynenko Ya.M. 288
 Lyubov V.M. 81
 Magunov I.R. 341
 Maizelis A.A. 35
 Makar L.I. 166, 309
 Makara V.A. 61
 Makauz I. 160
 Makhniy V.P. 159, 251
 Makhnovets H.V. 319
 Makovyshyn V.I. 286
 Maksymtsev Yu.R. 200
 Malanych G.P. 142, 157
 Malashkevich G.E. 108
 Maltanova A.M. 164
 Maltseva T.V. 274
 Malushin N.V. 229
 Malyk O.P. 320
 Malykhin S.V. 35
 Malyshev V.V. 148, 174, 175, 242
 Malyuta S.V. 157
 Mamontova I.B. 120, 289
 Mamykin S.V. 120, 168, 289
 Manuilov E.V. 63
 Mar'yan M. 252, 362
 Martynchuk V.E. 137, 139
 Martynenko I. M. 208
 Martynyuk M.I. 17
 Maryanchuk P.D. 255, 291
 Maslov V. 172
 Maslyanchuk O.L. 6
 Mateik H.D. 110
 Matkivska H. M. 149
 Matkivskiy O.M. 110, 356
 Matolin V. 201
 Matveeva L.A. 26
 Mazgel Yulia 345
 Mazur M. 268
 Mazur N. 31
 Mazur P. 189
 Mazur T.M. 82, 159, 241
 Medvid I.I. 141
 Melnichuk L. 83
 Melnichuk O. 83
 Melnik V.P. 38
 Melnychuk K. 315
 Melnyk V.V. 251
 Men'shov Yu.V. 19, 113
 Meriuts A.V. 96, 282
 Meshalkin A. 18, 217
 Metsan H. 42
Mezanne D. 15
 Mezhylovska L.Y. 318, 359
 Michailovska K. 300
 Midak L.Ia. 357
 Milenin G.V. 253
 Minenkov A. 78, 85
 Mironyuk I. 58, 59, 321

- Misjuk S.Ya. 323
 Mitin V.F. 26
 Mitsa V. 201
 Moiseenko M. 86
 Mokhnatskyi M.L. 198
 Molnar S. 160
 Morozovska A.N. 13
 Morushko O.V. 180
 Moskalenko S.A. 209
 Moskalenko V.A. 209
 Moskvyn P.P. 258
 Mozkova O.V. 341
 Mudry S.I. 213
 Mudryj S.I. 224
 Musiy R.Y. 220
 Mygushchenko R.P. 96
 Myhailovich V. 307
 Mykaylo O.A. 166, 309
 Mykhailovych V.V. 314
 Mykhalec A. V. 149
 Mykolaychuk O.G. 155, 165
 Mykytyn I. 59
 Myronchuk G.L. 312, 319
 Myslin M.V. 321
 Nagy Gy. 160
 Naidych B. 86
 Nakamura T. 162
 Natalych V.V. 152
 Naumenko M. 75
 Naumenko S.M. 143
 Naumov V.V. 63
 Naumovets A.G. 40
 Navozenko O. 191
 Nazarov A.N. 210, 234, 269, 280
 Nazarova T.M. 210
 Nedilko S. 185
 Nedilko S.A. 143
 Nedilko S.G. 41, 98, 143, 304, 335
 Nedolya A.V. 336
 Nenchuk T.M. 189
 Nevar Alena 345
 Nevgasimov O.O. 240
 Nichkalo S.I. 226, 302
 Nikitin V. 282
 Nikolayenko T.Yu. 218
 Nikolenko A.S. 230
 Nitsuk Yu.A. 72
 Nosenko V.V. 211
 Novak K.V. 19
 Novikov S. 161
 Novosad O.V. 254
 Nykyruy L. 32, 86, 87, 256, 268, 360
 Nyzhnykevych V.V. 212
 Oberemok O.C. 38, 196
 Odnodvoretz K. 33
 Odnodvoretz L.V. 208, 265
 Ogorodnik Y.V. 79, 224, 366
 Ohtsuka M. 162
 Okholin P.N. 210
 Olar O.I. 48
 Olenych I.B. 91, 144
 Oliinyk Z.M. 213
 Olikh O.Ya. 111
 Olikh Ya.M. 111
 Oliynich-Lysyuk A.V. 250, 257
 Onanko A.P. 214, 215
 Onanko Y.A. 214, 215
 Onyshchenko V. 150, 197, 281, 290
 Orazi L. 365
 Orletskyi I.G. 255, 291
 Orlov G.O. 80
 Ostafiychuk B.K. 163, 216
 Ostrauskaite J.A. 95
 Ovcharenko O. 181
 Ovcharyk R.Ya. 271
 Paiuk O. 18, 217
 Panasjuk L.I. 323
 Panasyuk M.R. 230
 Panchuk O.E. 332
 Parashchuk T.O. 86, 104
 Parasyuk O.V. 107
 Parfenyuk O.A. 255
 Pashchenko G.A. 324
 Pashkovska R.I. 272
 Pasishnyk O.V. 174
 Pavlenko O.L. 214, 215, 218

- Pavlyuk M. 268
 Pazukha I.M. 112, 169, 264
 Pedchenko Yu.M. 196
 Peleshchak R.M. 60, 103, 225
 Perekrestov V.I. 152, 203
 Perevoznikov S.S. 114, 164, 267
 Petkova T. 95
 Petrenko L.G. 202
 Petrovska S. 162
 Petrus R. 325, 331
 Petrushenko S.I. 80, 81, 88, 240
 Piaseski M. 340
 Pieniążek A. 293
 Pinchuk-Rugal T.M. 178, 214, 215
 Pinkovska M. B. 44
 Pinzenik V. 160
 Piryatinski Yu.P. 234
 Pisak R.P. 20, 266
 Piskach L.V. 340
 Plakhtii Ye.G. 105
 Pleshkun A.G. 148
 Pletenytska L.S. 358, 359
 Plyatsko S. 172, 258
 Pobigun-Halaiska O.I. 205
 Podlesny I.V. 209
 Poduremne D. 299, 329
 Pogosov V.V. 54
 Polischuk S.G. 275
 Polotnyak S.B. 301
 Pop M.M. 166
 Poplavskyi I.O. 163, 356
 Poplavskyi O.P. 189, 356
 Popov V.G. 38
 Popovych D.I. 28
 Popovych O.V. 53
 Poprugko V.M. 178
 Porada O.K. 100
 Portier X. 83
 Potera P. 87, 347
Potyak V.Yu. 244
Povkh M.M. 271, 272
 Poznyak S.K. 164
 Preuss Thomas 25
 Prigunova A.G. 326
 Prikhozha Yu. O. 92
 Prince K.C. 201
 Prisacar A. 18, 217
 Prokopenko I.V. 145, 158
 Prokopiv V.V. (Jr) 318
 Prokopiv V.V. 89, 241, 256, 360
 Protsenko I. 299
 Protsenko S.I. 265, 277, 330
 Protsenko Z.M. 170
 Prysyzhnyuk V.I. 165
 Pundyk I.P. 218
 Pylypenko O.V. 112
 Pylypiv V.M. 318
 Pylypko V.G. 171, 219
 Pysklynetsj U.M. 244
 Rachiy B.I. 180, 195, 220
 Rachkov A.E. 364
 Radchenko M.V. 179
 Radchenko T.M. 23
 Radishevskyi M. 278
 Rajta I. 160
 Raransky M.D. 250, 257
 Rarenko A.I. 339
 Rashkovetskyi L. 14, 172, 258
Razumnaya A. 15
 Red'ko R.A. 253
 Revo S.L. 41, 143, 220
 Revutska L. 115
 Rezinkin O.L. 281
 Rizak I.M. 309
 Rodionova T.V. 327
 Rogacheva E.I. 19, 113
 Rogachova O.I. 338
 Rokytska H.V. 221
 Rokytskyi M.O. 221, 222
 Romaka L.P. 328
 Romaka V.A. 328
 Romaka V.V. 328
 Roman Y. 307
 Romanenko R.P. 353
 Romankevich V. 161
 Romankevych V. 307

- Romanyuk B.M. 38
 Romanyuk V.R. 120, 289
 Romas' O.V. 264
 Roshchina N.M. 289, 344
 Rozhalovets K.S. 242
 Rozhkovskiy O.M. 215
 Rubish V.M. 20, 166, 266, 309
 Rudko G.Yu. 48, 234
 Rudko M.S. 230
 Rudko V. 300
 Rumiantsev D.V. 40
 Rusavsky A.V. 269, 280
 Ryabov L.V. 139
 Ryabtsev S.I. 259
 Rybalchenko D.S. 175
 Rybov L.V. 137
 Rylova A.K. 265
 Sabov T.M. 38
 Sachenko A.V. 123, 124
 Sadovyi B.S. 230
 Safriuk N. 102
 Sakhnyuk V.E. 223, 305
 Saliy Ya. P. 167, 329
 Saltykov D.I. 331
 Samoilenko T. 343
 Sapon S.V. 14
 Šauša O. 95
 Saviuk H.P. 356
 Savka S.S. 28
 Sawicka-Chudy P. 347
 Scherbatskii V.P. 41
 Schrader S. 191
 Seben V. 362
 Semenov A.V. 260
 Semikina T.V. 129, 168
 Semkiv I. 325, 331
 Semko T.O. 224
 Seneta M.Ya. 225
 Serba O. A. 124
 Serbin H.O. 66
 Serednytski A.S. 28
 Sergeeva A. E. 146, 147, 261, 262
 Sergiienko R. 162
 Serkiz R.Y. 230
 Seti Ju.O. 68
 Sevostianov S.V. 234
 Shabelnyk Yu. 299
 Shakhgildyan G. 204
 Shakhnin D.B. 174, 175, 243
 Shcherbak L.P. 219
 Shchotkin V.V. 169
 Shefer A.V. 296
 Sheludko V.I. 143, 306
 Shemerliuk Y.V. 104
 Shenderovsky V.A. 21
 Shendyukov V.S. 114, 164, 269
 Shepida M.V. 228
 Shevchenko G.P. 108
 Sheveleva K.Yu. 153
 Shipljak M. 160
 Shirinyan A.S. 61
 Shkurdoda Yu.O. 331
 Shkurenko O. 130
 Shmyrieva L.N. 168
 Shpak I. 265
 Shpak O. 265
 Shportko K. 115
 Shtapenko E.Ph. 234
 Shugorin O. 316
 Shugorin P. 316
 Shuliarenko D.O. 266
 Shumakova M.O. 267
 Shumakova N.I. 170, 208
 Shustava E. 346
 Shut A.M. 223
 Shut M.I. 221, 223
 Shved V.M. 62, 74
 Shymanovska V.V. 63
 Shynkarenko V.V. 296
 Sichkar T.G. 223
 Sidletsky V.O. 200
 Sirenko H.O. 17
 Skobeeva V.M. 231
 Skorenkyy Yu. 229, 318
 Skorik S.N. 260
 Slepkin O.P. 97

- Slipets A.A. 143
 Slobodyan A.M. 269
 Slobodyanik M.S. 334
 Slynko V.E. 29
 Slyotov M.M. 99, 251
 Slyotov O.M. 99
 Slyusarchuk Yu.M. 225
 Smertenko P.S. 63, 289, 343
 Smirnova O.V. 228
 Smutok O. 95
 Smyntyna V.A. 67, 229
 Snopok B.A. 184
 Sokolovskiy I. O. 123, 124
 Solntsev V.S. 63, 343
 Solodin S.V. 331
 Solodkiy M. 102
 Solodkyi M. 6, 298, 332
 Solomenko A. G. 93
 Solomon V.M. 308
 Solovyov M.V. 64, 65
 Solovyov V.V. 64
 Stadnyk Yu.V. 327
 Stara T. 300, 364
 Starchyk M. I. 44
 Stasyuk Z.V. 22
 Steblenko L.P. 347
 Stelmakh Y.A. 179
 Stepanov V.G. 210, 269
 Stepko A. 204
 Stetsenko O.M. 206
 Stetsun A.I. 292
 Stetsyk Sergii 131
 Stetsyuk T.V. 243
 Stoliarova S.S. 221
 Stolyarchuk A.I. 66
 Stolyarchuk I.D. 66
 Story T. 179
 Strativnov E.V. 121
 Strebezhev V.M. 171
 Strebezhev V.V. 171
 Strelchuk V.V. 230
 Strikha M.V. 13
 Strilchuk O. 172
 Stronski A. 18, 24, 106, 115, 217
 Studenyak I. 263
 Suchocki A. 293
 Sugak D. 293
 Sukach A.V. 100
 Sukhov V.N. 80, 88, 240
 Sumariuk O. 245, 306
 Suprun O. M. 333
 Surovitskiy S.V. 36
 Švajdlenková H. 95
 Svezhentsova K.V. 295
 Sviatenko A.M. 121
 Syrotyuk S.V. 319
 Syrotyuk Volodymyr 132
 Syvorotka I. 74, 245, 293
 Szakacs Zs.L. 173
 Tafiya D.P. 133
 Takagi Katsuyuki 5
 Takagi Toshiyuki 5
 Takáts V. 201
 Tarasenko Nikolai 344
 Tarnaj A.A. 20, 266
 Tashchuk R.Yu. 257
 Tatarchuk T. 58, 59, 320
 Tatarenko V.A. 23
 Tavrina T.V. 337
 Telbiz G. 24
 Temchenko V.P. 14
 Terao Tsuyoshi 5
 Terebilenko K.V. 334
 Terebinska M.I. 69
 Tereshchenko Alla 67
 Tertykh V.A. 234
 Teselko P.O. 41
 Tetyorkin V.V. 100
 Tistechok S.I. 73
 Titov I.M. 51
 Titov I.N. 335
 Titov Yu.O. 304
 Tkach M.V. 68
 Tkach V. 298, 332
 Tkachuk A.I. 100
 Tkachuk L. M. 312

- Tkachuk O.I. 69
 Tkachuk R.Z. 134
 Todoran D.C. 173
 Todoran R.D. 173
 Tomashik V.M. 50
 Tomashyk V.M. 142, 157
 Tomashyk Z.F. 142
 Toporovska L.R. 230
 Torchyniuk P.V. 123
 Tret'yak E.V. 108
 Tretyak A.P. 116, 310
 Triduh G. 18, 217
 Trishchuk L.I. 50, 323
 Trunov M.L. 20, 266
 Trzebiatowska M. 115
Tsap M. R. 70
 Tsebrienko T.V. 347
 Tsisar O.V. 339
 Tsizh B.R. 91, 144
 Tsud N. 201
 Tsybrii Z.F. 295
 Tsybulska L.S. 114, 164, 267
 Tsybaliuk T.P. 268
 Tuan V. Vu 107
 Tulzhenkova O.S. 222
 Tupys A.M. 73, 74
 Tur Y. 231, 345
 Turchak S.L. 62
 Turko B.I. 230
 Turovska L. 86, 241, 256, 336, 359
 Turukalo A.V. 279
 Tymochko M.D. 111
 Tytarenko V.V. 232
 Ubizskii S. 293
 Uhrin Robert 25, 117
 Uhryn Y.O. 103
 Us I.L. 73
 Uskova N.N. 174, 175, 242
 Vaksman Yu.F. 72
 Valakh M.Ya. 31, 194
 Vashchynskiy V.M. 233
 Vasin A.V. 234, 269
 Vasylechko L.O. 74, 374
 Vasylechko V.O. 73
 Vasyliiev O. 278
 Vasyliuk S.V. 65
 Vasylyev O.V. 133
 Vasylyeva H. 58, 58, 133
 Veleschuk V.P. 294
 Venger Ye. 83
 Venger E.F. 26
 Venhryn Yu.I. 28
 Veres M. 166, 201
 Verheles K.A. 374
 Vilinskaya L.N. 270
 Virnyi D. 234
 Virt I.S. 231, 345
 Vladimirskiy I.A. 363
 Vlasenko A.I. 294
 Vlasenko O.I. 309
 Vlasenko Z.K. 294
 Vlasiuk V. M. 123, 124, 269
 Vlaykov G.G. 137, 139
 VodORIZ O.S. 337
 Voitenko T.A. 143
 Voitkiv H.V. 106, 135
 Voitsekhivska O.M. 68
 Volchak G.V. 340
 Voloshko S.M. 363
 Vondráček M. 201
 Vorona I. 211, 300
 Vorontsova L.O. 347
 Vorovsky V.Yu. 55, 105
 Vovk S.M. 105
Vovk T.M. 271
 Vozniak O.M. 235, 359
 Voznyak O.O. 235
 Vuichyk M.V. 190, 295
 Vysochan L.M. 360
 V'yunov O.I. 123
 Waclawski T.K. 43
 Wilde G. 61
 Wisz G. 3, 346
 Włodarczyk D. 293
 Wojciechowski K.T. 104
 Yablon L.S. 53, 180, 195

Yakhnevych U. 293
 Yapontseva Yu.S. 274
 Yaremchuk I. 161
 Yaremiy I.P. 183, 198, 216, 272
 Yaremiy S.I. 271, 272
 Yaschenko O.V. 41
 Yashchenko L.M. 347
 Yashchynskiy L.V. 307, 322
 Yasinko T.I. 166, 308
 Yatskiv R. 269
 Yatsyshyn B.P. 237, 238
 Yavorskyi R. 87, 346, 348
 Yavorskyi Y. 32, 87, 241, 286
 Yavorskyi Y.V. 75
 Yemets A.I. 50
 Yukhymchuk V. 31, 63, 194, 308
Yurchyshyn L.D. 244
 Yuriychuk I.M. 171
 Yurkin I.M. 308
 Yurkovych N. 252, 361
 Yuryev S.O. 273
 Yushchuk S.I. 273
 Zabludovsky V.A. 232
 Zadorozhny V.G. 275
 Zagorodniy A.G. 94
 Zagorulko I.V. 156
 Zaitsev R.V. 10, 96
 Žak D. 345
 Zakharchuk D.A. 305, 307, 322
 Zakharuk Z.I. 338
 Zakiev I.M. 363
 Zakiev V.I. 363
 Zalevskyi D.V. 297
 Zamurueva O.V. 223, 339
 Zanevskii O.O. 303, 333
 Zapukhlyak R. 110, 268
 Zapukhlyak Z. 87, 349
 Zatovsky I.V. 76
 Zaulychnyy Ya.V. 75
 Zayachuk D.M. 29
 Zhadan D.O. 81
 Zhavrid Kate 344
Zhikharev V.N. 12

Zhydachevskyy Ya. 293
 Zhyrovetsky V.M. 28
 Zinchenko V.F. 340
 Zmiiovska E.O. 330
 Zubac I.A. 209
 Zubrytska K. 95
 .

Наукове видання

ФІЗИКА І ТЕХНОЛОГІЯ ТОНКИХ ПЛІВОК ТА НАНОСИСТЕМ

Збірник тез XVII Міжнародної Фреїківської конференції

МКФТТПН-ХVII

**PHYSICS AND TECHNOLOGY OF THIN FILMS AND
NANOSYSTEMS**

Abstract Book of XVII International Freik Conference

ICPTTFN-ХVII

Відповідальний за випуск *Любомир Никуруй*

Усі тези подано у авторській редакції

Підписано до друку 22.04.2019.

Формат 60x84/16. Ум. др. 23,5 арк. Гарнітура «Times New Roman».

Папір офсетний, друк цифровий. Тираж 300 примірників.

Видавець

ДВНЗ «Прикарпатський національний університет
імені Василя Стефаника»,

вул. С. Бандери, 1, м. Івано-Франківськ, 76000.

Тел. (0342) 71-56-22.

E-mail: vdvcit@pu.if.ua

Свідоцтво суб'єкта видавничої справи

ДК №2718 від 12.12.2006.