# ПУБЛИКАЦИИ ОСНОВНЫХ РЕЗУЛЬТАТОВ НАУЧНОЙ ДЕЯТЕЛЬНОСТИ СОТРУДНИКОВ ФИЗИКО-ТЕХНИЧЕСКОГО ИНСТИТУТА В РЕЙТИНГОВЫХ ЖУРНАЛАХ, ИНДЕКСИРУЕМЫХ В БАЗАХ ДАННЫХ WEB OF SCIENCE / SCOPUS ЗА ПЕРИОД С 2017 ПО 2020 гг.

1. V.I. Popov, D.V. Nikolaev, V.B. Timofeev, S.A. Smagulova, I.V. Antonova Graphene-based humidity sensors: The origin of alternating resistance change // Nanotechnology. – 2017. – Vol. 28. – Iss. 35. – 355501. DOI: 10.1088/1361-6528/aa7b6e. База данных: Scopus / Web of Science. Квартиль: Q1.

Аннотация

The response of a graphene-based humidity sensor is considered as a function of film structures. Analysis of the resistance changes due to water molecule adsorption on the graphene or multi-layer graphene (MLG) surface is performed for films with different structures and resistivities from hundreds of ohms/sq to hundreds of kilo-ohms/sq. The results revealed possible increase, decrease and non-monotonous behavior of resistance with changes in film structure. Adsorption of water molecules at grain boundary defects is assumed to lead to an increase in film resistivity due to the donor property of water and the p-type conductivity of graphene. Another type of conductive center with a higher capture cross-section is realized in the case of water molecule adsorption at edge defects in MLG films (the formation of conductive chains with ionic conductivity). If these chains form a continuous network the film resistivity decreases. The result of the competition between the opposite effects of the conductivity compensation and formation of the water-based conductive chains depends on the film structure and determines the response of humidity sensors. Sensor sensitivity is found to increase when only one type of defect determines water adsorption (edge defects or grain boundary defects).

2. Grigor’ev Yuri M. Quaternionic Functions and Their Applications in a Viscous Fluid Flow // Complex Analysis and Operator Theory. – 2018. – Vol. 12. – Iss. 2. – 491-508. DOI: 10.1007/s1178.5-017-0715-z. База данных: Scopus / Web of Science. Квартиль: Q1.

Аннотация

We used a quaternion function method for the Moisil–Theodoresco system (MTS). Solutions of the MTS are (left-) regular quaternion functions f(r) = *f*0(r) + f(r) = *f*0(*x,y,z*) + i*f*x(*x,y,z*) +
+ j*f*y(*x,y,z*) + **r***f*z(*x,y,z*) of a reduced quaternion variable r = i*x* + j*y* + k*z*. Here we present the quaternion three-dimensional representation of a general solution of the Stokes system for the slow flow of a viscous fluid in star-shaped domain. It is shown that in particular cases of plane and axially symmetric flows this representation goes into the representations by means of analytical and generalized analytical functions of complex variables. As applications the main problems the Stokes flow in a ball are solved.

3. M.N. Safonova, A.S. Syromyatnikova, G.A. Petasyuk, A.A. Fedotov, P.P. Tarasov, V.A. Kim A Study of the Influence of Natural Diamond Ultrafine Powders on the Properties of Metal Matrix Composites // Journal of Superhard Materials. – 2018. – Vol. 40. – Iss. 1. – P. 65-72. DOI: 10.3103/S1063457618010100. База данных: Scopus / Web of Science. Квартиль: Q2.

Аннотация

The influence of the percentage content and dispersion of natural diamond powders used as fillers on the properties of a tin- and copper-based composite material for abrasive applications has been studied. It has been experimentally found out that adding these fillers in certain amounts to the composite has a beneficial effect on the physical-mechanical properties and performance of the resulting material.

4. Antonova I.V., Kurkina I.I., Gutakovskii A.K., Kotin I.A., Ivanov A.I., Nebogatikova N.A., Soots R.A., Smagulova S.A. Fluorinated graphene suspension for flexible and printed electronics: Flakes, 2D films, and heterostructures // Materials and Design. – 2019. – Vol. 164. – P. 107526. DOI: 10.1016/j.matdes.2018.11.061. База данных: Scopus / Web of Science. Квартиль: Q1.

Аннотация

Fluorinated graphene (FG), the most stable derivative of graphene, is suggested for the role of functional material (weak fluorination degree) and the dielectric layers for graphene and other 2D materials, especially for flexible and printed electronics. The main findings discussed in the present study are (1) an excellent mechanical properties of FG in bending conditions for the first time measured for FG with different fluorination degree; (2) the 97–99% transparency of FG films with thickness up to 25 nm in wide range of wavelengths, (3) a ultralow leakage current and a high breakdown field in the printed cross-bar structures; (4) a smooth increase in interplanar spacing by 1–2% from the center of few-layered fluorinated graphene flakes to their edges; (5) observation of only CC related G line without defect related D line in Raman spectra in the case of giant amplification of Raman scattering for FG films printed at Ag layers. Unchanged characteristics of fluorinated graphene films up to stretching-strain values of 2.5–4% were demonstrated. Generally, it can be stated that fluorinated graphene films have great promise in flexible and printed electronics.

5. Sleptsov S.D., Savvinova N.A., Rubtsov N.A. Ice Melting with Allowance for Selective Absorption in the Medium // Journal of Engineering Thermophysics. – 2019. – Vol. 28. – Iss. 1.– P. 114-122. DOI: 10.1134/S1810232819010090. База данных: Scopus / Web of Science. Квартиль: Q2.

Аннотация

Melting of an ice layer on a vertical substrate heated by long-wave radiation is numerically simulated in a one-phase formulation of the Stefan problem. A simple model is proposed to take into account the presence of a thin water film on the irradiated surface. Ice is considered as a selectively absorbing material with two absorption bands. The calculated results are in reasonable agreement with the experiment.

6. Rozanov V. V., Matveichuk, I.V., Chernyaev, A.P., Nikolaeva, N.A., Krasnov, S.A. Current State and Lines of the Further Development of High-Tech Means of Radiation Sterilization // Bull. Russ. Acad. Sci. Phys. – 2020. – Vol. 84, № 4. – P. 403–405. DOI: 10.3103/S106287382004022X. База данных: Scopus / Web of Science. Квартиль: Q3.

Аннотация

New approaches are proposed for improving combined industrial technologies for the sterilization of bone implants, based on exposure to X-rays, gamma rays, and fast electron beams. The proposals open up prospects for further effective development of radiation technologies while reducing the absorbed dose and maintaining the sterility of bioimplants.

7. Rozanov V. V., Matveychuk, I.V., Chernyaev, A.P., Nikolaeva, N.A. Changes in the Morphological and Mechanical Characteristics of Bone Implants upon Radiation Sterilization // Bull. Russ. Acad. Sci. Phys. – 2019. – Vol. 83, № 10. – P. 1311–1315. DOI: 10.3103/S1062873819040208. База данных: Scopus / Web of Science. Квартиль: Q3.

Аннотация

Radiation sterilization of bone implants can lead to substantial morphological changes in them and the degradation of their physical and mechanical properties, depending on the magnitude of the absorption dose. The structure of bone samples changes starting at doses of 15 kGy. Raising the dose to 25–50 kGy affects the mechanical characteristics and osteinductive properties of bone implants. Data on the morphological and mechanical changes, and their analysis and systematization, are the scientific basis for developing modern requirements and practical recommendations for further improvement of the radiation technologies for the sterilization of biological tissues.

8. Klementiev K.E. et al. Radioprotective role of cyanobacterial phycobilisomes // Biochim. Biophys. Acta - Bioenerg. Elsevier B.V., 2019. Vol. 1860, № 2. P. 121–128. DOI: 10.1016/j.bbabio.2018.11.018. База данных: Scopus / Web of Science. Квартиль: Q1.

Аннотация

Cyanobacteria are thought to be responsible for pioneering dioxygen production and the so-called “Great Oxygenation Event” that determined the formation of the ozone layer and the ionosphere restricting ionizing radiation levels reaching our planet, which increased biological diversity but also abolished the necessity of radioprotection. We speculated that ancient protection mechanisms could still be present in cyanobacteria and studied the effect of ionizing radiation and space flight during the Foton-M4 mission on Synechocystis sp. PCC6803. Spectral and functional characteristics of photosynthetic membranes revealed numerous similarities of the effects of α-particles and space flight, which both interrupted excitation energy transfer from phycobilisomes to the photosystems and significantly reduced the concentration of phycobiliproteins. Although photosynthetic activity was severely suppressed, the effect was reversible, and the cells could rapidly recover from the stress. We suggest that the actual existence and the uncoupling of phycobilisomes may play a specific role not only in photo-, but also in radioprotection, which could be crucial for the early evolution of Life on Earth.

9. ﻿1. Mamaeva S. et al. Using Scanning Electron Microscopy and Atomic Force Microscopy to Study the Formation of Nanoparticles on Red Blood Cell Surface in Cervical Cancer Patients // Int. J. Biomed. – 2020. – Vol. 10, № 1. – P. 70–75. DOI: 10.21103/Article10(1)\_OA12. База данных: Web of Science.

Аннотация

Background: In this study, we used scanning electron microscopy (SEM) and atomic force microscopy (AFM) to examine the changes in morphology of red blood cells (RBCs) and to investigate the nanoparticles (NPs) found on their surface in cervical cancer (CC) patients undergoing radiation therapy (RT).

Methods and Results: We obtained smears of venous blood from 12 CC patients at the start, midway and at the end of external beam RT and then midway and at the end of brachytherapy. It was found that in CC patients, the number of RBCs with abnormal morphology increased and NPs appeared on their surface. During RT, the total number of abnormally shaped RBCs and the number and size of NPs increased. The RBC diameter was 8.38 +/- 0.36 mu m in the control group and 9.41 +/- 0.47 mu m in CC patients. The average diameter of NPs on the RBC surface was 69.91 +/- 12.15 nm and their average height 23.75 +/- 3.70 nm. After RT, the morphology of RBCs was restored, and the formation of NPs decreased.

Conclusion: The changes observed could serve as the basis for developing efficacy indicators of cancer radiation therapy.

10. Alekseev R.Z. и др. Assessment of change of erythrocytes by method of raster electronic microscopy at the persons who died of fatal hypothermia // YAKUT Med. J. – 2018. – № 4. – С. 18–21. DOI: 10.25789/YMJ.2018.64.05. База данных: Scopus / Web of Science.

Аннотация

The paper presents results of study of red blood cells (RBC) morphology of deceased from various causes (injury, hypothermia) by using scanning electron microscopy. The obtained data show that the appearance of certain forms of cadaveric erythrocytes depends on the causes of death. Therefore, when death is caused by stabbing and gunshots RBC take acanthocyte forms and in cases of fatal hypothermia - echinocyte forms. In vitro experiment at small negative temperatures the appearance of acanthocytes in blood samples is observed. Based on the obtained data and on the ability of echinocyte to return to normal form, it can be concluded that the probability of restoring the vital activity of the frozen organisms are possible.

11. Kononova, IV et al. Diagnostic significance of the human papilloma virus detection in blood // Yakut medical journal. – 2018. – Iss. 4. – P. 100-101. DOI: 10.25789/YMJ.2018.64.30. База данных: Scopus / Web of Science.

Аннотация

This article provides an overview of the investigations devoted to the human papillomavirus detection in blood and identifies unresolved issues arising from these investigations.