МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»

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Material and methods. Various analysis methods are used to investigate properties of polymer composites. X-ray diffraction dependencies are studied in order to monitor the formation of the nanocomposites. The X-ray diffraction peak is assigned to reflection at a specific angle corresponding to the interlayer spacing. Upon modification of polymer, the original peak shifts corresponding changes in interlayer spacing.The interactions among atoms or ions in polymer electrolyte under the investigation may induce changes in the vibrational modes of atoms and chains of the polymer. Fourier Transform Infrared (FTIR) sprectroscopyis used to analyze such changes.The glass transition temperature T_g is an important parameter for identifying the amorphousness of the semicrystalline solids.The Differential Scanning Calorimetry (DSC) thermogram of composites reflects the phase transition of polymer composite. The shift of T_g towards relatively lower temperatures with increasing the concentration of nanoparticles in the polymer composite reveals the disruption of the degree of crystallinity of the host polymer which facilitates the micromovement ofparts of polymer.

Results. Direct current (DC) conductivity studies can be used to determine mechanisms of DC in polymer composites. Conductive properties depend on nanoparticle concentration, particle size, dispersion, polymer-nanoparticle interaction. Temperature dependencies of DC conductivity allow determining the energy of activation of conductivity. Value of the conductivity activation energy depends on the conduction level of the organic phase (host polymer) and inorganic phase (nanoparticles). On the one hand, the presence of nanoparticles reduces the degree of crystallinity of the polymer matrix and subsequently increases the free volume, which enhances charge carrier mobility. On the other hand, the increase of nanoparticles concentration means an increase of polymer heterogeneity, which results in an increase of nanoparticle-polymer interface resistance. As the nanoparticles concentration reaches its critical value, the conductivity of polymer composite can be explained by the formation of conducting nanoparticles aggregations. A competition of the interfacial polarization and conductivity enhancement by introducing inorganic nanoparticles leads to the conductivity saturation and minimization of the activation energy.Electrical impedance spectroscopy is performed in order to analyze relaxation mechanisms in polymer composites. The frequency dependence plot of total conductivity of polymer composites is studied in order to reveal regions of frequency independency and regions of frequency dependency. These two regions are separated with transition region at certain frequency defined as the hopping rate. This behavior arises from the competition of both DC conductivity and conductivity due to the ionic polarization besides the electronic one. The hopping rate of Arrhenius' plot provides opportunity to deduce value of energy activation of hopping conduction mechanism in polymer composites. Electrical impedance frequency dependencies can be represented in other plots. The Cole-Cole diagramcan be used to extract values of the relaxation time of polarization in polymer composites, which in turn, allow determining hopping distances for polymer composites.

Conclusions. Dielectric relaxation is a result of the reorientation process of dipoles in the polymer chains. Ionic motion and polymer segmentation motion are strongly coupled for electrolyte which canmanifest as a single peak in the imaginary part of electrical modulus M'' spectra with no corresponding feature in dielectric spectra.

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INNOVATIVE STRUCTURAL ELEMENTS OF BONE PLATES FOR FRACTURE OSTEOSYNTHESIS

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Introduction. According to WHO, injuries related to fractures rank 4th in the world. Domestic statistics indicate that every year in Ukraine, about 97,500 Ukrainians are injured due to falls. The bones of the skull, spine and limbs are most injured. High-energy injuries associated with the effect on the human body of high speeds, temperatures, currents, for example, a traffic accident, a fall from a height, a blow, a gunshot wound, constant bone overload, which affects one in three

athletes, Crohn's disease, celiac disease, and Cushing's syndrome are factors that lead to fractures. It is clear that it is impossible to insure yourself against a fracture.

The aim of the study. Innovative design of osseous plates for osteosynthesis.

Material and methods. Solid osseous plates, flushes, wire cerclage,the cavity fixators, device for conducting wire cerclages. Developing design and installation of bone plates.

Results. There are the following types of damage: one that affects a narrow area of long bones, namely a flexion fracture; one where the parts of the broken bone will be turned to each other along the axis - twisted fractures; such, where with unexpected tension due to the fact that the strength of the muscles and ligaments is greater than the strength of the bones, the integrity of the periosteum is violated – a detached type. There are also fractures due to displacement, transverse, scapular, hammered, oblique, screw-shaped, longitudinal, etc. The relevance of the topic increases in direct proportion to the increase in mortality and the number of disabled persons among young patients, because, due to such statistics, we have less able-bodied population, which in turn creates an economic problem.

Periosteal osteosynthesis is widely used in the operative treatment of fractures and injuries of long bones. The use of this type of osteosynthesis is associated with a number of problems that arise during the installation of the fixator, its blocking, and the creation of stable fixation of fragments.To install existing bone plates, it is necessary to drill holes through the cortical substance of the bone, cut a thread in the holes, insert screws to create a static or compressive version of osteosynthesis. It is known that in order to create a reliable and stable fixation of fragments, it is necessary to drill at least 4-6 holes for screws on each side of the fracture line, however, as is known, a large number of holes in the cortical substance of the bone causes its significant weakening, which negatively affects strength and rigidity of the created biotechnical system "bone-fixator". In addition, the nature of the fracture (multifragmentary, helical, etc.) does not always allow for the required number of fixing screws, which makes it impossible to create stable and reliable fixation of broken bone fragments. All stages of the operation are associated with certain medical and technical difficulties.

Innovative developments in the direction of changing the design of osseous plates for osteosynthesis in case of fractures indicate the feasibility of using solid osseous plates, flushes on both sides of them, and wire cerclage attached to these flushes using a device for conducting wire cerclages (Pat. 114603, 2017); the expediency of reducing the weight of the plate, reducing the area of its contact with the bone surface with minimal damage to the periosteum, thanks to the use of cavity fixators, which allows free circulation of biological fluids, which significantly accelerates the period of bone growth; and increased rigidity in the sagittal and frontal planes, as well as during torsion, due to the use of the S-shaped side sections (Pat. 128128, Pat. 140568, 2020).

Conclusions. The proposed changes in the designs of the periosteal plates eliminate a number of problems: they do not require drilling holes in the cortical horn of the bone, prevent the eccentricity effect of fragment compression, etc.

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ADVANTAGES IN THE USE OF THE LAPLACIAN KERNEL FOR IMAGE PROCESSING IN MATLAB

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Introduction. When preparing and conducting radiation therapy for a patient, an important prerequisite for a quality radiation treatment is the development of a treatment plan. In order to start developing a treatment plan in the treatment planning system (TPS), you need a high-quality CT image of the patient, which visualizes the area of irradiation and clearly visible organs located in risk zones near the tumor. The presence of visualization noise on CT images, unclear contours of tissues and organs, and artifacts complicate the preparation of a treatment plan and reduces its quality.