МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ’Я УКРАЇНИ
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»

М А Т Е Р І А Л И

104-ї підсумкової науково-практичної конференції
з міжнародною участю
професорсько-викладацького персоналу
БУКОВИНСЬКОГО ДЕРЖАВНОГО МЕДИЧНОГО УНІВЕРСИТЕТУ
06, 08, 13 лютого 2023 року

Конференція внесена до Реєстру заходів безперервного професійного розвитку, які проводитимуться у 2023 році №5500074

Чернівці – 2023

portable X-ray imaging technology, and X-ray imaging performance can be improved in terms of device physics, materials, and manufacturing methods. The problems associated with X-ray plates have encouraged the development of substitute substrate materials that provide high flexibility, portability, transparency, and relatively low thickness (polyester materials).

For decades, high-quality scintillators of reinforcing screens have been developed to reduce the impact of X-ray radiation due to its attenuation (materials activated by rare earth elements with high atomic numbers, e.g.lanthanum bromide oxide, lanthanum oxysulfide, etc.) and high image quality.

The quality of the X-ray images is assessed by the following physical parameters: spatial resolution, contrast and noise. High resolution is achieved due to flat-panel X-ray detectors with direct conversion based on α-Se, which are characterized by extremely low level of radiation scattering, high contrast by wide linear ranges of detectors, low noise level by calculation of Wiener spectra coefficients.

In the field of computed tomography, significant results in the quality of images are achieved through the use of spectral (multi-energy) computed tomography. The main advantage of this technique is that the tube parameters (voltage and current) and filters can be adjusted independently to adjust the radiation dose, photon flux and spectrum according to the patient's body condition and clinical indications.

Furthermore, tomography technologies in combination with X-ray microscopy are able to provide 3D-images of biological samples from nano- to micro-size that correspond to cellular resolution in vivo or ex vivo. A new transmission X-ray microscope can obtain 3D-images of cells with nanoscale based on the difference in X-rays absorption between organics and water, filling the niche between cryo-electron tomography and ultrahigh resolution fluorescence microscopy.

Conclusions. Dynamic digital radiography technology, which creates moving X-ray images (uses continuous pulses of approximately 15 frames per second to capture respiratory movements, limb or neck movements), is already approved in medical practice. There is also a tendency of integrating artificial intelligence technologies for automatic disease detection.

Tkachuk I.G.

PHOTOSENSITIVE $CuFeO_2$ / n-InSe HETEROJUNCTIONS

Department of Biological Physics and Medical Informatics
Bukovinian State Medical University

Introduction. Indium monoselenide InSe has a band gap Eg = 1.2 eV which is in the range of optimal values for photoelectric conversion of the solar spectrum in terrestrial conditions. The layered structure of InSe crystals with a weak Van der Waals bond between the layers provides them with an advantage over other semiconductors in the manufacture of substrates for heterostructures by avoiding ingot cutting operations, mechanical and chemical surface treatment. In addition, the resistance of InSe to radiation expands the scope of its use.

The aim of the study. The use of indium selenide as a base material allows to create photosensitive structures of different types: based on metal / semiconductor contact , homojunctions and heterojunctions .

Material and methods. The presence of a weak Van der Waals bond between the layers and a strong ion-covalent bond in the layers in InSe determines the features of the physical properties of the crystals. In particular, the existing structural defects significantly affect the electrical properties. Packaging defects, dislocation grids placed in the plane (0001), create additional energy barriers Eδ for the movement of charge carriers along the c-axis, which causes large values of electrical conductivity anisotropy. Due to the existence of vacancies and dislocations, localized states appear near the Fermi level.

Results. Transparent conductive oxides are materials with high electrical conductivity and low optical absorption of visible light. Thin films of transparent conductive oxides are widely used in various devices such as flat panel displays, touch panels and solar panels. Delaphosites are triple oxides of copper and iron with the basic formula ABO_2, where A represents monovalent cations, such as Cu or Ag, and B represents trivalent metals from Al to La. Delaphosite $CuFeO_2$ is a p-type semiconductor, the band gap of which can vary from 0.91 to 3.35 eV . $CuFeO_2$ has a relatively high electrical conductivity compared to other delaphosites, only $CuCrO_2$ is higher. $CuFeO_2$ can exhibit both the properties of multipheroism and spintronics. Investigation of magnetic and magnetoelectric properties of $CuFeO_2$ is intensively studied.

This paper presents the results of the study of the electrical properties and spectral photosensitivity of the $CuFeO_2$ / n-InSe heterojunction fabricated by spray pyrolysis of pyrite thin films on n-InSe substrates.

Conclusions. The spectral dependence of the quantum efficiency of the $CuFeO_2$ film irradiated from the $CuFeO_2$ / n-InSe heterostructure in the range of photon energies 1.2 ÷ 3.2 eV with a maximum at 2.3 eV has been studied. It is established that the long-wavelength edge of photosensitivity at hν = 1.2 eV is due to the edge of fundamental absorption in n-InSe. $CuFeO_2$ thin films are polycrystalline, as a result of which the intrinsic absorption edge is blurred due to partial absorption at the grain boundaries compared to monocrystalline materials. At energies $h\nu < E_g = 2.4$ eV) part of the radiation is absorbed at the grain boundaries. In this case, light that is able to be absorbed in n-InSe does not penetrate into the base region due to absorption in $CuFeO_2$.

Vlad H.I.

MORE ON THE EXTENSION OF LINEAR OPERATORS ON RIESZ SPACES

Department of Biological Physics and Medical Informatics
Bukovinian State Medical University

Introduction. The classical Kantorovich theorem asserts the existence and uniqueness of a linear extension of a positive additive mapping, defined on the positive cone E^+ of a Riesz space *E* taking values in an Archimedean Riesz space *F*, to the entire space *E*. We prove that, if *E* has the principal projection property and f is Dedekind *σ*-complete then for every $e \in E^+$ every positive finitely additive f-valued measure defined on the Boolean algebra F_e of fragments of c has a unique positive linear extension to the ideal E_e of E generated by *e*. If, moreover, the measure is τ-continuous then the linear extension is order continuous.
Main result:

The aim of the study. Given a Riesz space E and e ∈ E, by F, we denote the Boolean algebra of all fragments of e, and by E_e, the ideal of E generated by e, that is,

$$F_e = \{x \in E: x \sqsubseteq e\} \text{ and } E_e = \{x \in E: (\exists\lambda > 0)\ |x| \le \lambda|e|\}.$$

Material and methods. Let B be a Boolean algebra and F be a Riesz space. A mapping ν: B → F+ is called a positive finitely additive vector measure if ν (x ⊔ y) = ν(x) + ν(y) for all disjoint x, y ∈ B. A positive finitely additive vector measure ν: B → F is called:

- τ-continuous provided for every nonempty upward directed set A ⊆ Bfor which sup A exists in B one has that sup ν(A) exists in F and ν(sup A) =sup ν(A);
- σ-continuous provided for every increasing sequence (x_n) in B for which $\sup_n x_n$ exists in B one has that $\sup_n \nu(x_n)$exists in F and $\nu(\sup_n x_n) = \sup_n \nu(x_n)$.

Theorem 1. Let *E* be a Riesz space with the principal projection property, 0 < e ∈ E and F be a Dedekind σ-complete Riesz space. Then for every positive finitely additive vector measure ν: Fe → F there exists a unique positive linear operator T: E_e → F, which extends ν, that is, T*x* = *ν*(*x*) for all *x* ∈ Ee. Moreover, if ν is τ-continuous (or σ-continuous) then T is order continuous (respectively, order σ-continuous).

Results. Example 1. Set E = L_p := Lp[0, 1] with $0 \le p < \infty$, F = L∞, e = $1_{[0,1]}$ (the characteristic function of [0, 1]). Then $B_e = L_p$, and the measure ν: F_e → F defined by setting ν(x) = x for all x ∈ F_e has no positive linear extension T: $L_p \to L_\infty$.

Conclusions. Indeed, if such an extension T existed then it would satisfy (1) in place of $\tilde{T}$, which implies T*x* = *x* for all e-step functions x. Then, Tx = x for all x ∈ L_∞. It concludes that T is a linear bounded projection of L_p onto the non-closed linear subspace L_∞ of L_p, which contradicts the boundedness of T.