Водночас, був розширений діапазон співпраці держави та приватного бізнесу у формі державно-приватного партнерства як інструменту боротьби з пандемією коронавірусу. Окрім традиційних підходів щодо розбудови об’єктів інфраструктури та надання пов’язаних послуг, предметом угод стали проведення прикладних досліджень у галузі розробки вакцин та ліків від Ковід-19, розробки, спрямовані на виявлення і діагностику захворювання, відстеження пацієнтів, запобігання зараженням та захисту медичного персоналу.

В якості прикладу можна навести Ізраїль з його співпрацею між медичною сферою, оборонною промисловістю та приватними компаніями в їхніх зусиллях надати Міністерству охорони здоров’я неінвазивні пристрої вентиляції. Результатом стала розробка простих моделей вентиляційних пристроїв за низькою ціною з наявних ресурсів і перепрофілювання виробничих ліній оборонних компаній для їх виробництва.

Таким чином, незважаючи на економічну рецесію, державно-приватне партнерство зуміло проявити свій потенціал у сфері охорони здоров’я на прикладі боротьби з коронавірусом.

СЕКЦІЯ 22
ФІЗИЧНІ ДОСЛІДЖЕННЯ В МЕДИЦИНІ

Fediv V.I.

QUANTUM DOT AS FLUORESCENCE/MAGNETIC RESONANCEDUAL-MODAL IMAGING AGENT

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Dual-modal imaging by combining magnetic resonance (MR) and near-infrared (NIR) fluorescence can integrate the advantages of high-resolution anatomical imaging with high sensitivity in vivo fluorescent imaging, which is expected to play a significant role in biomedical researches.Therefore, it is highly desirable to develop a dual-modal imaging probe for both cell fluorescence imaging and *in vivo*MRI with high sensitivity and deep penetration.

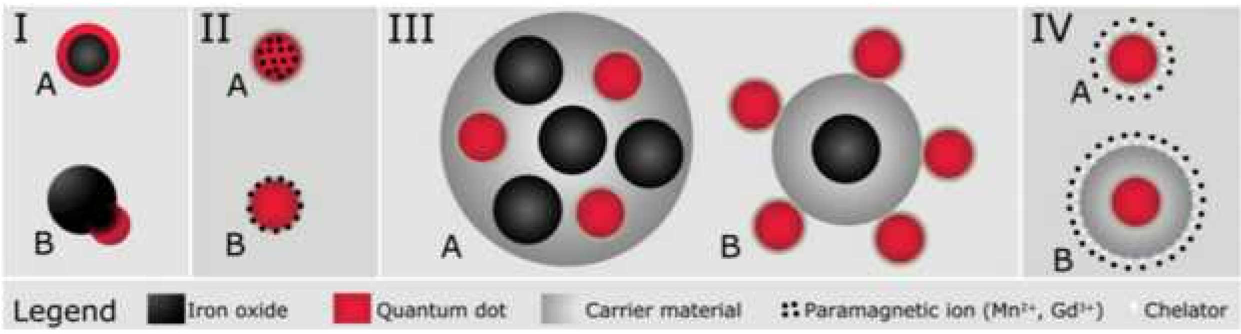

Figure. Schematic representation of the four types of magnetic quantum dots.
(I. Core-shell and heterostructures of magnetic and semiconductor materials; II. Semiconductor nanoparticles doped with paramagnetic ions; III. Composite particles combining magnetic and semiconductor nanoparticles; IV. Semiconductor nanoparticles with a paramagnetic coating of Gd-chelates.)

Quantum dots (QDs) have attracted attention as fluorescent nano-probes in biomedical imaging because of their unique optical properties of broad absorption, narrow emission, tunable emissive wavelength and excellent resistance to lightbleaching. Magnetic resonance imaging (MRI) contrast agents are widely used to increase the contrast difference between normal and abnormal tissues.The majority of MRI contrast agents are either paramagnetic (usually made from dysprosium (Dy^{3+}), the lanthanide metal gadolinium (Gd^{3+}), or the transition metal manganese (Mn^{2+})) or superparamagnetic (iron oxide) magnetite particles.

One of many dual-modal imaging agent are magnetic QDs. As is well-known four different architectures of magnetic QDs that have been reported to date (Fig.) Each of which synthesized using a wet chemical procedure, in which the magnetic core is synthesized prior to the attachment of the semiconductor material.Moreover, types of combination both materials give us possibilities a number of ways for changing different properties of magnetic QD.

Galushko K.S.

POYNTING VECTOR COMPONENTS OF QUASIMONOCHROMATIC FIELD

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The study of the angular momentum, energy currents, which create it in the polychromatic waves, are on the first stage. At the same time, such an investigation has quite good perspectives, first of all, in fundamental aspects. One of them is related with the statement, that the value of angular momentum must be connected with the coherence characteristics of a polychromatic wave. The existence of such relationship is obvious. As it is known the angular momentum may be separated into orbital and spin part. At least, this statement follows from the fact, that the spin angular momentum is defined by the determinate circulation of the field vector. Naturally, the “level of such determinancy” must be connected with coherency.

Let us consider the quasimonochromatic wave, which is additionally obeyed the paraxial approximation.

Correspondingly, under this assumption, the instantaneous Poynting vector may be derived similarly to one of strongly coherent case: A_i, Φ_i are interpreted according to Eq. (1), A_i^l, Φ_i^l – partial derivatives of $A_i(t)$ and $\Phi_i(t)$, $i, l = x, y$.

It can be rather easily illustrated, that under our assumptions the following expressions as the “base” of averaging procedure take place

Thus it can be stated that the notation of averaged Poynting components of quasichromatic wave is the same for strongly monochromatic wave with corresponding determinate parameters.

The terms in the square brackets of the 1-st and 2-nd equations can be called as structure or orbital transversal part of field energy density. Just these terms, in coherent case, are responsible for appearance of orbital momentum in the area of vortex (scalar field) or C-point, point of circular polarization, in inhomogeneously polarized field.

The last terms in the expressions of transversal components causes of spin energy currents, which define the spin angular momentum of the field.

Correspondingly, if one takes into account, that angular momentum density is defined as follows: one can state that for polychromatic beam (similarly to coherent case), at least, for the wave with narrow spectrum and when paraxial approximation is satisfied, the total angular momentum may be divided on the orbital and spin parts.

Gutsul O.V.

INFLUENCE OF INFRASONIC OSCILLATIONS ON LIQUID FLOW IN CAPILLARIES

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To study the effect of infrasonic oscillations on the flow rate of liquids with different electrical conductivity, we designed a hydromechanical generator of infrasonic periodic oscillations with the ability to smoothly adjust the amplitude and period of oscillations in the range of 0,5–50 sec. The process of fluid flow in the capillary was studied by the electrode method on a computerized installation described in.

During the experiment, the dependence of *I(t)* at *U=const* was measured using digital voltammeters B7-21, which were connected to the computer via interface adapters, and the compiled program allowed to observe the graphical time dependences of the experimental $I = f_1$(t) and computational $1/I = f_2(t)$ functions at $U = const$.