Scientific and commercial value of designed proposal

Scientific value of attacking problem is in creation new methods reliable determination deformation energy and destruction transport vehicles constructional elements as a result of AT. Using stated principles in autotechnical examination permit to determine speed of transport vehicle movement more accurate at a time of accomplishment AT.

Next scientific results:

— a methods energy costs estimation of transport vehicle damaged in percussion loading;

— moving transport vehicle speed calculation algorithm at a moment preceding to a hit, at a moment of throwing back transport vehicle consideration kinetic energy loss at a hit, and also at a moment previous to emergency conditions.

Commercial value of designed proposal is in opportunity to create transport vehicles with manage strength and inflexibility.

Practical significance of results. Practical value of the project is in using transport vehicles speed estimation methods and principles as a result AT. Possibility of determination deformation energy and transport vehicles destruction as a consequence of AT permits to estimate deflected mode consideration strain anisotropy, plasticity resources and other factors on dynamic deformation stages. It gives an opportunity to provide a basis of damages computer simulation.

Expected results.

As a result of the project modern methods of estimation energy loses at shock loads on damaged transport vehicles constructional elements. Developed calculation device permits to estimate transport vehicle speed of movement as well in a result of AT as in a result damage computer simulation. Calculation result of deflected mode and estimation of extremely possible regimes in manufacturing operation metal forming at transport vehicles manufacturing allow to create auspicious heredity (residual stress field, controlling grain growth in a connection with heat treatment, material plasticity residual life and etc.). At next transport vehicle dynamic loading (for example, as a result of AT or damage simulation) technological heredity supply controlled strength and Shandong inflexibility constructional elements. It permits to design and manufacture secure transport vehicles constructions.

RESEARCH LABORATORY «OPTOELECTRONICS AND SOLAR POWER ENGINEERING»

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The basic directions of scientific research of laboratory and the results of research in the field of materials science of new semiconductors for opto-, micro- and acoustoelectronics, sensing and solar energy are shown.

Recently studying of mono- and polycrystalline compounds from A_2B_6 group and some other materials has attracted an increased interest. This is due to the fact that it can be used as an anti-reflective, absorptive and window layers of photovoltaic unijunction and tandem solar cells (SC), base layers of photodetectors and hard radiation detectors, injection photodetectors, light-emitting diodes, gas sensors, pyro-and piezoelectronic devices [1...3] etc. A number of these compounds (ZnS, ZnSe, ZnTe) is cadmium free. It is important in widespread application from an environmental point of view. However, the problem of practical use of chalcogenides of zinc and cadmium in micro- and optoelectronics has not solved yet due to the lack of scientific basis of film materials science of binary compounds and technologies of obtaining of single- and multilayer structures based on them with the require, reproduction and stable parameters.

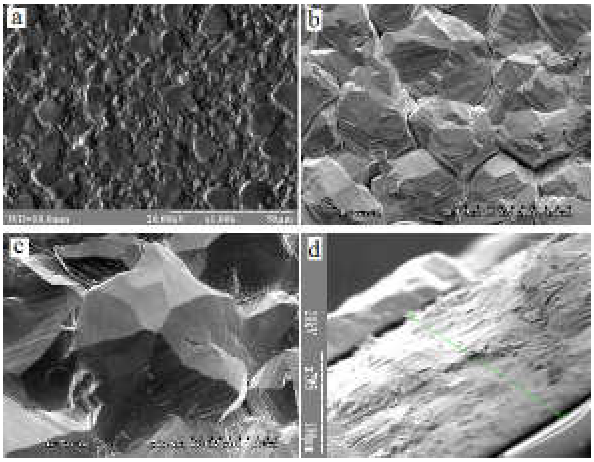

Fig. 1. SEM images of thin films of CdTe (d=3...5 mkm), obtained at substrate temperature of Ts = 550 ℃ (a); thick layers of CdTe (d=80...100 mkm), obtained at Ts = 400 ℃ (б); Ts = 550 ℃ (c); fraktogram of the film, Ts = 550 ℃ (d) [19]

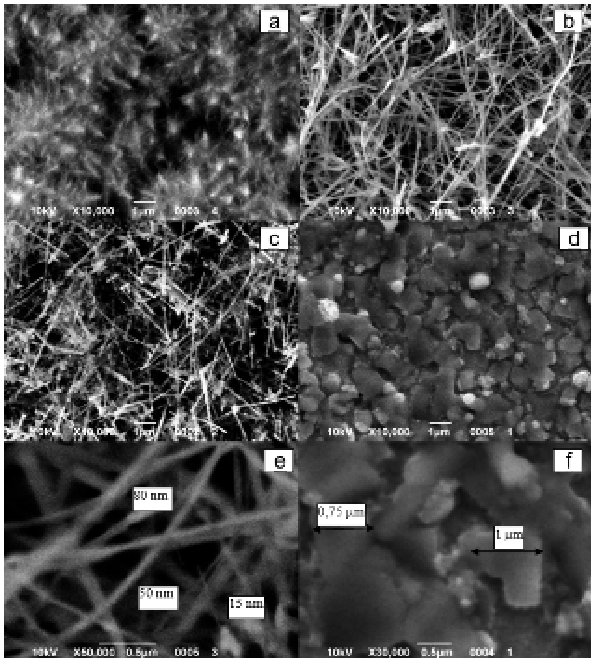

Fig. 2. SEM images of the films of ZnS and nanostructures, obtained on ZnSe monocrystals at different substrate temperature of T_s, ℃: 150 (a); 240 (b, e); 350 (c); 550 (d, f) [18]

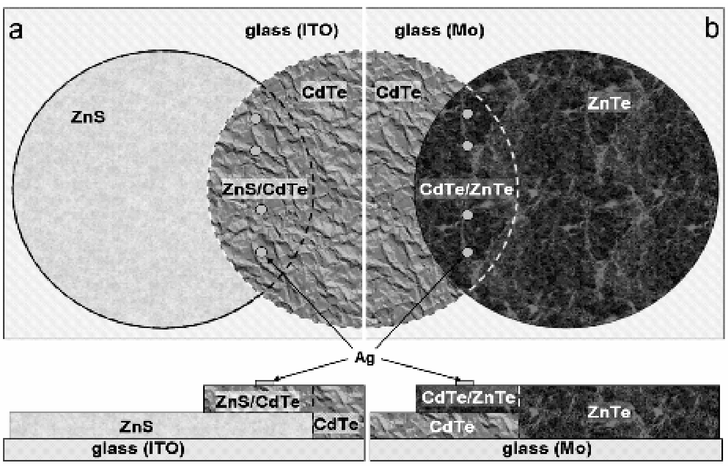

Fig. 3. Scheme of multilayer structures of glass-ITO-ZnS-CdTe and glass-molybdenum-CdTe-ZnTe for use in solar cells [17]

Direction of laboratory scientific activities is associated with the researchers of structural, electrical and optical compound properties of A_4B_6 (SnS, SnSe), A_2B_6 (CdTe, CdSe, ZnO, ZnTe, ZnSe, ZnS) and solid solutions based on them (CdMnTe, CdMnS, ZnCdTe); studying of defect formation process; properties of thin film heterojunctions based on these compounds. Great attention is given to the study of a new class of four-components compounds such as CZTS (Se) (Cu_2ZnSnS_4 and $Cu_2ZnSnSe_4$) which is perspective for use in solar energy as absorbing layers of thin-film solar cell for widespread use.

The main goal of the research is to create a device structures (solar cells, optical detectors, and hard radiation detector gases) based on heterojunctions and semiconductor-metal structures. Examples of single-layer and multi-layer structures that we are studying are shown in Fig. 1...3. The main results of these studies are published in [4...12].

For films obtaining we use vacuum techniques (such as close-spaced vacuum sublimation method thermal vacuum and electron beam evaporation) [5...7, 9...14, 17...18] and non-vacuum methods (such as chemical bath deposition, spray pyrolysis) [20]. For research of the films we apply: scanning electron microscopy and transmission electron microscopy [7, 12, 18...19], X-ray diffractometry analysis (determination of phase composition, lattice period, texture quality, coherent scattering domain size, microdeformation) [7, 11, 12, 16...18], X-ray spectral microanalysis (EDAX) [18], the method of characteristic X-rays induced by proton beam (PIXI) [12], Rutherford backscattering spectrometry (RBS) [9], optical spectroscopy (studying of the spectral dependence of the reflectance $R(\lambda)$ and transmittance $T(\lambda)$, determine of the band gap) [10, 12, 18],dependence of the conductivity-temperature studying [5], dark current-voltage characteristics, including of the regime of space charge limited currents [5, 21]. Also we developed the methods of the point defects ensemble modeling in materials using quasi-chemical reactions [8] and calculate the basic parameters of solar cells based on heterojunctions [17].

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MULTICHANNEL SNIFF RECOGNIZER AND ITS THEIR CONCENTRATIONS

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Multichannel sniff recognizer (MSRC-1) is designed for rapid analysis and determination of odors concentrations. The database of the determined substances is approximately 100 agents (lubricants fuel, combustion of various materials, adhesives, alcohols, detergents, technical and perfume materials).

One of the most promising research directions in the development of micro-electronic converters proposed in the paper is the use of the dependence of reactive properties and negative resistance of semiconductor devices from the influence of external physical quantities, and the creation on this basis a new class of micro-electronic frequency converter of gas concentrations and recognition of odors. In devices of this type occurs a transformation of gas concentration, and other external influences into a frequency signal that allows you to create micro-electronic converters in the integrated technology and permits you to increase the speed, accuracy and sensitivity, to expand the range of measured values, to improve reliability, noise immunity and long-term stability of parameters.

The use of frequency as an informative parameter avoids the application of amplification devices, and analog-to-digital converters in the information processing, which reduces the cost of monitoring and control systems.

Multichannel sniff recognizer (MSRC-1) is designed for rapid analysis and determination of odors concentrations.

Fig. 1. Device MSRC-1 appearance

Ergonomics of the Device. The device has the following dimensions: 340×140×180 mm. Weight: 2,8 kg with battery. The size and weight of the device is intended as well for the work in the laboratory as in the «field» and fully meets the requirements for the portable equipment. Weight and autonomy of the device allows you to work in certain circumstances, for example, on the airfield, as well as in testing the aircraft in the shop, if you want to carry out multiple measurements while holding the device at arm's length at a height of more than 1,5 m.

The metal body provides shock resistance and protection of the device from external electromagnetic fields, and also provides radio and electromagnetic compatibility with aircraft equipment.

MSRC-1 meets the ability to connect to various network resources (such as network 220 V, and with the use of the battery). Power connector from 220 V European Standards, which is not diffi-