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Key words: center of collective use, experimental methods of nanomaterials and nanostructures research.

At present RSREU Regional Center of Probe Microscopy of collective use (RCPMcu) (www.ckp.rsreu.ru) is one of the leading centers for collective use of scientific equipment of Russian Federation performing their own research and working over industrial orders. Technical capabilities of the centre are constantly improved as a result of latest high-tech equipment purchase and the development of new diagnostic methods of nanomaterials and nanostructures research. More than half of center staff consists of young scientists and students of RSREU Faculty of Electronics.

RSREU RCPMcu was established in 2003 at the Departments of Microelectronics and Industrial electronics by the decision of the University and the Government of Ryazan region. Main scientific directions of the center are development of probe nanotechnology and experimental methods of nanomaterials and nanostructures research.3

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Key words: DFA, Brownian noise, Gaussian noise, scaling exponent, 2D DFA, fluctuation function, roughness, crossover

A realization of detrended fluctuation analysis method for analysis of profile structure complexity of one-dimensional signals and two-dimensional surfaces was considered. Method features such as “smoothness” characteristic of surface profile roughness, using the crossover effect of the function for diagnostics of self-organization processes were studied. AFM-images of amorphous hydrogenated silicon were investigated by 2D DFA.12

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Key words: integrated circuit, injection, MOS-structure, method of testing, dielectric layers, defect.

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Key words: current deep level transient spectroscopy, point barrier contact.

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Key words: atomic force microscopy, probe artifacts, artifacts detection, artifact suppression

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Key words: disordered semiconductors, contact phenomena, modified TOF method, atomic force microscopy.

This paper presents modified TOF method of conductivity of disordered semiconductors and contact phenomena in barrier structures based on them. The scope of application, advantages and limitations of modified TOF method and the possibility of its collaborate usage with other experimental research methods are presented. It is shown that the combined use of TOF method with the technique of atomic force microscopy provides additional opportunities of TOF method and displays a new level of diagnostic methods of micro- and nanostructures.....39

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Key words: heterophase ferroelectric film, PZT, nonvolatile memory, optical information reading, photovoltaic effect.

It is shown that the films obtained by sol-gel processing with excessive Pb content in 5-15 mol% solution are characterized by short-circuit photocurrent of unipolar while in the samples obtained by technology MOCVD short-circuit photocurrent is observed only after the polarization and direction is determined by the direction of polarizing electric field. Increase of Pb concentration in excess solution to 30 mol% leads to the disappearance of entire thickness of columnar film crystalline structure and reduce the amplitude of short-circuit photocurrent to zero.....43

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Key words: polymorphous silicon, photoconductivity, absorption, Staebler-Wronski effect.

Structural, photoelectric and optical properties of polymorphous silicon deposited at different substrate temperatures were under study. Thin films under investigation had similar properties in annealed state, but increase of substrate temperature led to manufacturing the material with higher stability of properties after exposure to light. Long exposure to light changed the shape of temperature dependencies of photoconductivity. Corresponding changes in density of states in mobility gap, which explains the results, are discussed.....47

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Key words: thin film of amorphous hydrogenated silicon different composition, photovoltaic energy converters, spectral characteristics.

Thin films of amorphous hydrogenated silicon different thickness (20, 50, 100, 200 nm) and composition (i-Si:H, i-Si_{1-x}C_x:H and p-Si_{1-x}C_x:H) deposited on glass substrate were investigated by optical spectroscopy. It is shown that the configuration of hydrogen bonds in the investigated

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Key words: nanocomposite films, silicon-carbon matrix, structure, nanocrystals, chemical composition.

The effects of heat treatments in vacuum and oxygen on the composition and distribution of nanophase in the films of metal-silicon - carbon nanocomposites are investigated. It is shown that effect of heat treatment is determined by interaction of oxygen as with elements of forming amorphous matrix and with tantalum carbide nanocrystals. Qualitative model of the processes occurring in these interactions is proposed.56

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Key words: phases of variable composition, metal oxides, resistive random access memory, gas sensors, magnetic nanomaterials, hierarchical porous structures.

Application prospects of mixed non-stoichiometric metal oxide nanomaterials for resistive random access memory devices, gas sensors and functional magnetic coatings are considered. Experimental results of controlling adsorption sites energy properties of sensor metal oxides and electron-beam modification of their surface properties are shown. Possibilities for sensitivity and selectivity increasing are revealed to be associated with electric perturbation action with variable frequency on hierarchical structured samples. Peculiarities of sol-gel synthesis of mixed metal oxide magnetic materials are discussed.59

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Key words: carbyne, electrical properties, quantum conductivity.

Monoatomic chains (carbyne) are the simplest carbon molecular systems which are of great interest as the materials for nanoelectronics. In this work, electrical conductivity of polyynic chains having several tens of carbon atoms are studied in terms of quantum chemistry. Ballistic electron transport according to which electrons tunnel through the carbyne without any energy losses due to the interactions with lattice vibrations, impurities or defects is analyzed. For low-temperature region, current-voltage characteristics of system are obtained as the results of solution of wave equation. Step-like dependence of current from the voltage typical for quantum wires is obtained.68

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Key words: Raman spectroscopy, doping, amorphous thin films, phase-change memory, GST225.

In this study we investigated the influence of doping isomorphous impurities (such as Bi, Sn, as well as In) on short range structure of Ge₂Sb₂Te₅ amorphous thin films using Raman spectroscopy. The shift of main bands at 125 cm⁻¹ and 153 cm⁻¹ in Raman spectrum is determined by the type and concentration of impurities. The influence of isothermal crystallization (T_c = 170°C) on Raman spectra of Ge₂Sb₂Te₅ thin films was studied as well.74

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Key words: phase change memory cells, doping of Ge₂Sb₂Te₅.

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Key words: water electrical conductivity, low noise fluctuation, temperature.

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Key words: Daubechies wavelets, wavelet transform, Radon transform, image processing, back scattering, total integrated scattering.

Method of one-dimensional defects selection such as scratches or traces of processing tool action as applied to superpolished mirror substrates meant for precision laser gyro is elaborated. An anomic force microscope image as initial information about the surface is used. Relief characteristic properties are selected by means of combined application of Radon transform and wavelet filtering. The influence of polishing quality on laser radiation scattering is analyzed. The method makes possible to search optimum azimuth position of mirror optical surface in the ring cavity.....92

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Key words: nanocrystalline indium oxide, adsorption, nitrogen dioxide, dynamic conductivity, impedance, charge carriers transport.

Samples of nanocrystalline indium oxide with different nanocrystal sizes are prepared by sol-gel method. The smallest mean size of nanocrystals is 7÷8 nm and the biggest size is 18÷20 nm. The influence of nitrogen dioxide adsorption on frequency dependences of conductivity in nanocrystalline indium oxide were investigated. The mechanism of charge carriers transport in the samples studied was proposed as a result of the data received.98

A.P. Avachev, N.V. Vishnyakov, D.V. Suvorov. FEATURES OF REMOTE ACCESS TRAINING SYSTEMS TO SCANNING PROBE MICROSCOPY EQUIPMENT OF RSREU CENTER FOR COLLECTIVE USE

Key words: distance learning, remote access, laboratory studies.

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