

Belous A. I., Gasenkova I. V., Drozd S. E., Konnov E. V., Mukhurov N. I., Belous V. A. *Technological Variant of Realization of the Design of Capacity Voltage Converter LSIC for MEMS Sensors* 2

In the article there are examined one of variants of constructive — technological construction and creation of capacity-voltage converter LSIC for electronic circuit of general application MEMS sensor. The suggested block diagram LSIC sensor can be used for making MEMS with capacitive output from a sensitive element.

Keywords: optimization of parameters MEMS sensors, capacity-voltage converter, integrated circuits, designs, technology

Anikin Yu. A., Kloss Yu. Yu. , Martynov D. V., Tcheremissine F. G. *Computer Simulation and Analysis of the Knudsen experiment of the 1910 year* 6

In 1910 Martin Knudsen studied the thermal creep effect in a cylindrical pipe with an applied temperature gradient. The researcher developed the device that could work as a pump under certain conditions. This invention has found a practical interest in the modern nano- and microtechnologies. In this work the Knudsen experiment is repeated by means of computer simulation of the kinetic Boltzmann equation. The results obtained are compared.

Keywords: Knudsen pump, simulation, kinetic Boltzmann equation, unstructured grids, projection method

Petrov V. V., Nazarova T. N., Kopilova N. F., Zabluda O. V., Kisilev I., Bruns M. *Study of Physical and Chemical, Electrophysical Properties and Gas Sensitive Characteristics of $\text{SiO}_2\text{—SnO}_x\text{—CuO}_y$ Nanocomposite Films* . . . 15

In the work formation of $\text{SiO}_2\text{—SnO}_x\text{—CuO}_y$ thin sol-gel films was studied. Investigation of their physical and chemical and electrophysical properties were carried out. Gas sensitive characteristics also were studied. It is defined that the sensor on the base of $\text{SiO}_2\text{—SnO}_x\text{—CuO}_y$ films shows the selective sensitivity to NO_2 in a range of working temperatures 100—200 °C.

Keywords: sol-gel method, gas-sensitive material, nitrogen dioxide

Glukhova O. E., Slepchenkov M. M. *Electronic and Elastic Properties of Graphane — New Material of Electronics: Quantum Chemical and Empirical Study* 22

It is established that the unsaturated by hydrogen nanoparticle of graphane (graphane) is elastic material by help of the molecular-mechanical method. At the same time the modulus of cushioning of graphane depends on its size that allows to define the linear parameter of graphane with maximum Young modulus for this material. Electronic structure of graphane nanoparticles is researched by semiempirical method PM3. It is established that graphane nanoparticles one can to characterise as insulator at that its band gap of the electronic spectrum decreases with the length growing and tend to defined value. At the same time ionization potential also decreases. The comparative analysis of calculated amounts with analogous parameters of single layer nanotubes is carried out.

Keywords: graphane nanoparticle, pseudo Young modulus, axial compression, band gap spectrum

Malishev A. V. *Features of Lithium-Titanium Ferrite Ceramics Polarization Properties* 24

For the first time loop-shaped electrical polarization dependences from electric field intensity (dielectric hysteresis) are registered for lithium-titanium ferrite ceramics. Temperature evolution of a hysteresis curve parameters is explored for ferrite samples. The received results can be interpret in sight of Maxwell-Vagner relaxation polarization or in sight of polarization connected with ferroelectrics state forming in ferrite electrical subsystem.

Keyword: dielectric relaxation polarization, dielectric hysteresis, ferroelectricity

Shtennikov V. N. *Problems and Prospects of Use of Free Materials from Lead in the Military and Space Technics* 27

Application free from lead of technology of installation of electronic devices has created many new problems. It is necessary for the internal enterprises and the organisations to make active works on liquidation of negative consequences of introduction of free technologies from lead.

Keywords: the device, free technology from lead, soldering, a component, solder, the printed-circuit board

Kostsov E. G., Sokolov A. A. *Microelectromechanical Fuel Injector for Diesel Engines*. 30

The investigation of the possibilities of effective electrostatic actuators construction, i. e. drives manufactured by microelectronic technique and fuel injectors for diesel engines. The operation of actuators with high specific energy, up to $0.3\text{--}3\text{ J/m}^2$ is based on electromechanical energy conversion in nanoscale gaps (5–200 nm), separating the surface of moving electrode and the ferroelectric layer.

The nozzles are able to bring fuel under high pressure over 100 MPa and for a short time, hundreds of microseconds or less. Compared to the modern piezoelectric injectors they have much smaller dimensions and weight, as well as they enable to reduce the time of injection.

Keywords: diesel engines, fuel injectors, MEMS, electrostatic micromotor, high energy output, electromechanical energy conversion

Bobrov A. A., Popkov A. F., Dyuzhev N. A., Kulagin N. E., Makhboroda M. A., Mednikov A. M. *Calculation of the Thermal Mass Flow Membrane Sensor*. 34

The paper is devoted to the design principles and main problems of developing of integer thermal anemometer fabricated by the usage of silicon membrane technology. Physical model of the developed anemometer construction is described. Theoretical analysis of temperature regimes of functioning of thermo-resistive transducer in the stationary mode and relation of output characteristics to the mostly important construction parameters are discussed. Calculated anemometer characteristic is compared with the results of experimental measurements.

Keywords: MEMS-technology, gas flow sensor, temperature-compensated membrane, dynamic range of measurements, flow speed

Dragunov V. P., Ostertak D. I. *Electrostatic Interactions in MEMS with Plane-Parallel Electrodes. Part II. Estimation of electrostatic forces*. 40

The different approaches for calculation of electrostatic force components, acting between the electrodes of plane capacitor, composed of two identical rectangular or round electrodes, are compared. The analytical expressions for estimations of electrostatic force components are presented. The deviations in estimations of electrostatic force components, acting between the electrodes due to the variation of interelectrode gap and overlapping area of the electrodes, are calculated.

Keywords: MEMS, electric capacitance, plane capacitor, fringing field effect, electrostatic force components

Boronahin A. M., Podgornaya L. N. *Micromechanical Sensors Application for Railway Track Diagnostic*. . . 47

The possibility of the micromechanical accelerometers and gyroscopes application for the railway track diagnostics is considered. The algorithm of railroad irregularities definition is developed. The results of the system experimental passage are given.

Keywords: micromechanical accelerometer, micromechanical gyroscope, inertial measurement unit, railroad diagnostics, railroad defects

For foreign subscribers:

Journal of "NANO and MICROSYSTEM TECHNIQUE" (Nano- i mikrosistemnaya tekhnika, ISSN 1813-8586)

The journal bought since november 1999.

Editor-in-Chief Ph. D. Petr P. Maltsev

ISSN 1813-8586.

Address is: 4, Stromynsky Lane, Moscow, 107076, Russia. Tel./Fax: +7(499) 269-5510.

E-mail: nmst@novtex.ru; http://www.microsystems.ru

Адрес редакции журнала: 107076, Москва, Стромьинский пер., 4. Телефон редакции журнала **(499) 269-5510. E-mail: nmst@novtex.ru**

Журнал зарегистрирован в Федеральной службе по надзору за соблюдением законодательства

в сфере массовых коммуникаций и охране культурного наследия.

Свидетельство о регистрации ПИ № 77-18289 от 06.09.04.

Дизайнер *Т. Н. Позорелова*. Технический редактор *Е. М. Патрушева*. Корректор *Т. В. Пчелкина*

Сдано в набор 21.06.2010. Подписано в печать 20.07.2010. Формат 60×88 1/8. Бумага офсетная. Печать офсетная.

Усл. печ. л. 6,86. Уч.-изд. л. 8,66. Заказ 571. Цена договорная

Отпечатано в ООО "Подольская Периодика", 142110, Московская обл., г. Подольск, ул. Кирова, 15