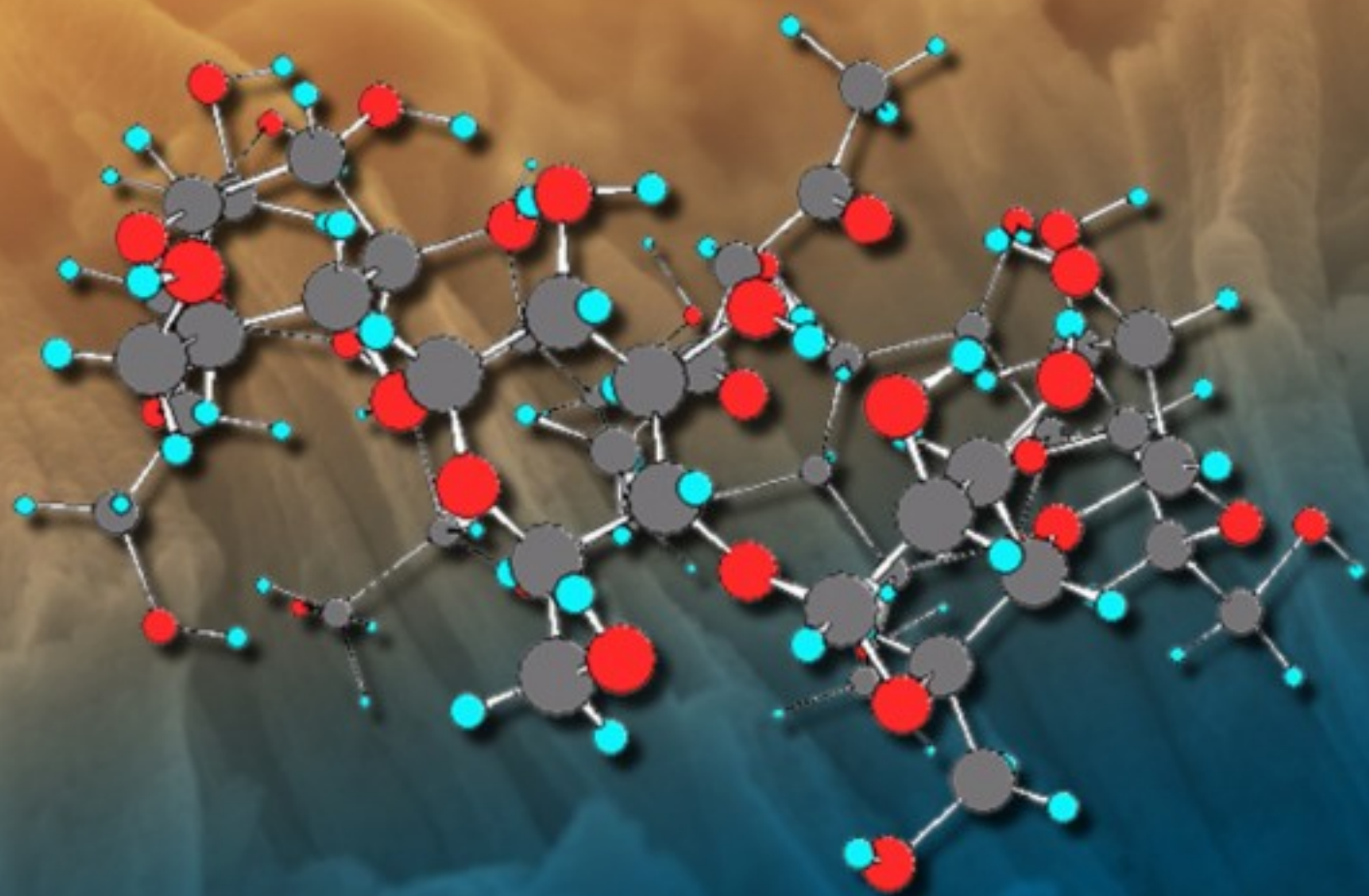


ISSN 1726-5479

SENSORS **11** vol. 146 & TRANSDUCERS **/12**



Nanosensors and Nanodevices

International Frequency Sensor Association Publishing



Editors-in-Chief: professor Sergey Y. Yurish, tel.: +34 696067716, e-mail: editor@sensorsportal.com**Editors for Western Europe**Meijer, Gerard C.M., Delft University of Technology, The Netherlands
Ferrari, Vittorio, Università di Brescia, Italy**Editors for North America**Datskos, Panos G., Oak Ridge National Laboratory, USA
Fabien, J. Josse, Marquette University, USA
Katz, Evgeny, Clarkson University, USA**Editor South America**

Costa-Felix, Rodrigo, Inmetro, Brazil

Editor for Eastern Europe

Sachenko, Anatoly, Ternopil State Economic University, Ukraine

Editor for Asia

Ohyama, Shinji, Tokyo Institute of Technology, Japan

Editor for Africa

Maki K.Habib, American University in Cairo, Egypt

Editor for Asia-Pacific

Mukhopadhyay, Subhas, Massey University, New Zealand

Editorial Advisory Board

- Abdul Rahim, Ruzairi**, Universiti Teknologi, Malaysia
Ahmad, Mohd Noor, Northern University of Engineering, Malaysia
Annamalai, Karthigeyan, National Institute of Advanced Industrial Science and Technology, Japan
Arcega, Francisco, University of Zaragoza, Spain
Arguel, Philippe, CNRS, France
Ahn, Jae-Pyoung, Korea Institute of Science and Technology, Korea
Arndt, Michael, Robert Bosch GmbH, Germany
Ascoli, Giorgio, George Mason University, USA
Atalay, Selcuk, Inonu University, Turkey
Atghiaee, Ahmad, University of Tehran, Iran
Augutis, Vygtantas, Kaunas University of Technology, Lithuania
Avachit, Patil Lalchand, North Maharashtra University, India
Ayesh, Aladdin, De Montfort University, UK
Azamimi, Azian binti Abdullah, Universiti Malaysia Perlis, Malaysia
Bahreyni, Behraad, University of Manitoba, Canada
Baliga, Shankar, B., General Motors Transnational, USA
Baoxian, Ye, Zhengzhou University, China
Barford, Lee, Agilent Laboratories, USA
Barlingay, Ravindra, RF Arrays Systems, India
Basu, Sukumar, Jadavpur University, India
Beck, Stephen, University of Sheffield, UK
Ben Bouzid, Sihem, Institut National de Recherche Scientifique, Tunisia
Benachaiba, Chellali, Universitè de Bechar, Algeria
Binnie, T. David, Napier University, UK
Bischoff, Gerlinde, Inst. Analytical Chemistry, Germany
Bodas, Dhananjay, IMTEK, Germany
Borges Carval, Nuno, Universidade de Aveiro, Portugal
Bouchikhi, Benachir, University Moulay Ismail, Morocco
Bousbia-Salah, Mounir, University of Annaba, Algeria
Bouvet, Marcel, CNRS – UPMC, France
Brudzewski, Kazimierz, Warsaw University of Technology, Poland
Cai, Chenxin, Nanjing Normal University, China
Cai, Qingyun, Hunan University, China
Calvo-Gallego, Jaime, Universidad de Salamanca, Spain
Campanella, Luigi, University La Sapienza, Italy
Carvalho, Vitor, Minho University, Portugal
Cecelja, Franjo, Brunel University, London, UK
Cerda Belmonte, Judith, Imperial College London, UK
Chakrabarty, Chandan Kumar, Universiti Tenaga Nasional, Malaysia
Chakravorty, Dipankar, Association for the Cultivation of Science, India
Changhai, Ru, Harbin Engineering University, China
Chaudhari, Gajanan, Shri Shivaji Science College, India
Chavali, Murthy, N.I. Center for Higher Education, (N.I. University), India
Chen, Jiming, Zhejiang University, China
Chen, Rongshun, National Tsing Hua University, Taiwan
Cheng, Kuo-Sheng, National Cheng Kung University, Taiwan
Chiang, Jeffrey (Cheng-Ta), Industrial Technol. Research Institute, Taiwan
Chiriac, Horia, National Institute of Research and Development, Romania
Chowdhuri, Arijit, University of Delhi, India
Chung, Wen-Yaw, Chung Yuan Christian University, Taiwan
Corres, Jesus, Universidad Publica de Navarra, Spain
Cortes, Camilo A., Universidad Nacional de Colombia, Colombia
Courtois, Christian, Universite de Valenciennes, France
Cusano, Andrea, University of Sannio, Italy
D'Amico, Arnaldo, Università di Tor Vergata, Italy
De Stefano, Luca, Institute for Microelectronics and Microsystem, Italy
Deshmukh, Kiran, Shri Shivaji Mahavidyalaya, Barshi, India
Dickert, Franz L., Vienna University, Austria
Dieguez, Angel, University of Barcelona, Spain
Dighavkar, C. G., M.G. Vidyamandir's L. V.H. College, India
Dimitropoulos, Panos, University of Thessaly, Greece
Ding, Jianning, Jiangsu Polytechnic University, China
Djordjevich, Alexander, City University of Hong Kong, Hong Kong
Donato, Nicola, University of Messina, Italy
Donato, Patricio, Universidad de Mar del Plata, Argentina
Dong, Feng, Tianjin University, China
Driljaca, Predrag, Instersema Sensoric SA, Switzerland
Dubey, Venketesh, Bournemouth University, UK
Enderle, Stefan, Univ. of Ulm and KTB Mechatronics GmbH, Germany
Erdem, Gursan K. Arzum, Ege University, Turkey
Erkmen, Aydan M., Middle East Technical University, Turkey
Estelle, Patrice, Insa Rennes, France
Estrada, Horacio, University of North Carolina, USA
Faiz, Adil, INSA Lyon, France
Fericean, Sorin, Balluff GmbH, Germany
Fernandes, Joana M., University of Porto, Portugal
Francioso, Luca, CNR-IMM Institute for Microelectronics and Microsystems, Italy
Francis, Laurent, University Catholique de Louvain, Belgium
Fu, Weiling, South-Western Hospital, Chongqing, China
Gaura, Elena, Coventry University, UK
Geng, Yanfeng, China University of Petroleum, China
Gole, James, Georgia Institute of Technology, USA
Gong, Hao, National University of Singapore, Singapore
Gonzalez de la Rosa, Juan Jose, University of Cadiz, Spain
Granell, Annette, Goteborg University, Sweden
Graff, Mason, The University of Texas at Arlington, USA
Guan, Shan, Eastman Kodak, USA
Guillet, Bruno, University of Caen, France
Guo, Zhen, New Jersey Institute of Technology, USA
Gupta, Narendra Kumar, Napier University, UK
Hadjiloucas, Sillas, The University of Reading, UK
Haider, Mohammad R., Sonoma State University, USA
Hashsham, Syed, Michigan State University, USA
Hasni, Abdelhafid, Bechar University, Algeria
Hernandez, Alvaro, University of Alcalá, Spain
Hernandez, Wilmar, Universidad Politecnica de Madrid, Spain
Homentcovschi, Dorel, SUNY Binghamton, USA
Horstman, Tom, U.S. Automation Group, LLC, USA
Hsiai, Tzung (John), University of Southern California, USA
Huang, Jeng-Sheng, Chung Yuan Christian University, Taiwan
Huang, Star, National Tsing Hua University, Taiwan
Huang, Wei, PSG Design Center, USA
Hui, David, University of New Orleans, USA
Jaffrezic-Renault, Nicole, Ecole Centrale de Lyon, France
James, Daniel, Griffith University, Australia
Janting, Jakob, DELTA Danish Electronics, Denmark
Jiang, Liudi, University of Southampton, UK
Jiang, Wei, University of Virginia, USA
Jiao, Zheng, Shanghai University, China
John, Joachim, IMEC, Belgium
Kalach, Andrew, Voronezh Institute of Ministry of Interior, Russia
Kang, Moonho, Sunmoon University, Korea South
Kaniasas, Eugenijus, Vienna University of Technology, Austria
Katake, Anup, Texas A&M University, USA
Kausel, Wilfried, University of Music, Vienna, Austria
Kavasoglu, Nese, Mugla University, Turkey
Ke, Cathy, Tyndall National Institute, Ireland
Khelfaoui, Rachid, Université de Bechar, Algeria
Khan, Asif, Aligarh Muslim University, Aligarh, India
Kim, Min Young, Kyungpook National University, Korea South
Ko, Sang Choon, Electronics. and Telecom. Research Inst., Korea South
Kotulska, Malgorzata, Wroclaw University of Technology, Poland
Kockar, Hakan, Balikesir University, Turkey
Kong, Ing, RMIT University, Australia
Kratz, Henrik, Uppsala University, Sweden

Krishnamoorthy, Ganesh, University of Texas at Austin, USA
Kumar, Arun, University of Delaware, Newark, USA
Kumar, Subodh, National Physical Laboratory, India
Kung, Chih-Hsien, Chang-Jung Christian University, Taiwan
Lacnjevac, Caslav, University of Belgrade, Serbia
Lay-Ekuakille, Aime, University of Lecce, Italy
Lee, Jang Myung, Pusan National University, Korea South
Lee, Jun Su, Amkor Technology, Inc. South Korea
Lei, Hua, National Starch and Chemical Company, USA
Li, Fengyuan (Thomas), Purdue University, USA
Li, Genxi, Nanjing University, China
Li, Hui, Shanghai Jiaotong University, China
Li, Sihua, Agiltron, Inc., USA
Li, Xian-Fang, Central South University, China
Li, Yuefa, Wayne State University, USA
Liang, Yuanchang, University of Washington, USA
Liawruangrath, Saisunee, Chiang Mai University, Thailand
Liew, Kim Meow, City University of Hong Kong, Hong Kong
Lin, Hermann, National Kaohsiung University, Taiwan
Lin, Paul, Cleveland State University, USA
Linderholm, Pontus, EPFL - Microsystems Laboratory, Switzerland
Liu, Aihua, University of Oklahoma, USA
Liu Changgeng, Louisiana State University, USA
Liu, Cheng-Hsien, National Tsing Hua University, Taiwan
Liu, Songqin, Southeast University, China
Lodeiro, Carlos, University of Vigo, Spain
Lorenzo, Maria Encarnacio, Universidad Autonoma de Madrid, Spain
Lukaszewicz, Jerzy Pawel, Nicholas Copernicus University, Poland
Ma, Zhanfang, Northeast Normal University, China
Majstorovic, Vidosav, University of Belgrade, Serbia
Malyshev, V.V., National Research Centre 'Kurchatov Institute', Russia
Marquez, Alfredo, Centro de Investigacion en Materiales Avanzados, Mexico
Matay, Ladislav, Slovak Academy of Sciences, Slovakia
Mathur, Prafull, National Physical Laboratory, India
Maurya, D.K., Institute of Materials Research and Engineering, Singapore
Mekid, Samir, University of Manchester, UK
Melnyk, Ivan, Photon Control Inc., Canada
Mendes, Paulo, University of Minho, Portugal
Mennell, Julie, Northumbria University, UK
Mi, Bin, Boston Scientific Corporation, USA
Minas, Graca, University of Minho, Portugal
Mishra, Vivekanand, National Institute of Technology, India
Moghavvemi, Mahmoud, University of Malaya, Malaysia
Mohammadi, Mohammad-Reza, University of Cambridge, UK
Molina Flores, Esteban, Benemérita Universidad Autónoma de Puebla, Mexico
Moradi, Majid, University of Kerman, Iran
Morello, Rosario, University "Mediterranea" of Reggio Calabria, Italy
Mounir, Ben Ali, University of Sousse, Tunisia
Mrad, Nezh, Defence R&D, Canada
Mulla, Imtiaz Sirajuddin, National Chemical Laboratory, Pune, India
Nabok, Aleksey, Sheffield Hallam University, UK
Neelamegam, Periasamy, Sastra Deemed University, India
Neshkova, Milka, Bulgarian Academy of Sciences, Bulgaria
Oberhammer, Joachim, Royal Institute of Technology, Sweden
Ould Lahoucine, Cherif, University of Guelma, Algeria
Pamidighanta, Sayanu, Bharat Electronics Limited (BEL), India
Pan, Jisheng, Institute of Materials Research & Engineering, Singapore
Park, Joon-Shik, Korea Electronics Technology Institute, Korea South
Passaro, Vittorio M. N., Politecnico di Bari, Italy
Penza, Michele, ENEA C.R., Italy
Pereira, Jose Miguel, Instituto Politecnico de Seteбал, Portugal
Petsev, Dimiter, University of New Mexico, USA
Pogacnik, Lea, University of Ljubljana, Slovenia
Post, Michael, National Research Council, Canada
Prance, Robert, University of Sussex, UK
Prasad, Ambika, Gulbarga University, India
Prateepasen, Asa, Kingmoungut's University of Technology, Thailand
Pugno, Nicola M., Politecnico di Torino, Italy
Pullini, Daniele, Centro Ricerche FIAT, Italy
Pumera, Martin, National Institute for Materials Science, Japan
Radhakrishnan, S., National Chemical Laboratory, Pune, India
Rajanna, K., Indian Institute of Science, India
Ramadan, Qasem, Institute of Microelectronics, Singapore
Rao, Basuthkar, Tata Inst. of Fundamental Research, India
Raouf, Kosai, Joseph Fourier University of Grenoble, France
Rastogi Shiva, K., University of Idaho, USA
Reig, Candid, University of Valencia, Spain
Restivo, Maria Teresa, University of Porto, Portugal
Robert, Michel, University Henri Poincare, France
Rezazadeh, Ghader, Urmia University, Iran
Royo, Santiago, Universitat Politècnica de Catalunya, Spain
Rodriguez, Angel, Universitat Politècnica de Catalunya, Spain
Rothberg, Steve, Loughborough University, UK
Sadana, Ajit, University of Mississippi, USA
Sadeghian Marnani, Hamed, TU Delft, The Netherlands
Sapozhnikova, Ksenia, D.I.Mendeleyev Institute for Metrology, Russia
Sandacci, Serghei, Sensor Technology Ltd., UK
Saxena, Vibha, Bbhba Atomic Research Centre, Mumbai, India
Schneider, John K., Ultra-Scan Corporation, USA
Sengupta, Deepak, Advance Bio-Photonics, India
Seif, Selemani, Alabama A & M University, USA
Seifter, Achim, Los Alamos National Laboratory, USA
Shah, Kriyang, La Trobe University, Australia
Sankarraaj, Anand, Detector Electronics Corp., USA
Silva Giroa, Pedro, Technical University of Lisbon, Portugal
Singh, V. R., National Physical Laboratory, India
Slomovitz, Daniel, UTE, Uruguay
Smith, Martin, Open University, UK
Soleimanpour, Amir Masoud, University of Toledo, USA
Soleymanpour, Ahmad, University of Toledo, USA
Somani, Prakash R., Centre for Materials for Electronics Technol., India
Sridharan, M., Sastra University, India
Srinivas, Talabattula, Indian Institute of Science, Bangalore, India
Srivastava, Arvind K., NanoSonix Inc., USA
Stefan-van Staden, Raluca-Ioana, University of Pretoria, South Africa
Stefanescu, Dan Mihai, Romanian Measurement Society, Romania
Sumriddetchka, Sarun, National Electronics and Comp. Technol. Center, Thailand
Sun, Chengliang, Polytechnic University, Hong-Kong
Sun, Dongming, Jilin University, China
Sun, Junhua, Beijing University of Aeronautics and Astronautics, China
Sun, Zhiqiang, Central South University, China
Suri, C. Raman, Institute of Microbial Technology, India
Sysoev, Victor, Saratov State Technical University, Russia
Szewczyk, Roman, Industr. Research Inst. for Automation and Measurement, Poland
Tan, Ooi Kiang, Nanyang Technological University, Singapore
Tang, Dianping, Southwest University, China
Tang, Jaw-Luen, National Chung Cheng University, Taiwan
Teker, Kasif, Frostburg State University, USA
Thirunavukkarasu, I., Manipal University Karnataka, India
Thumbavanam Pad, Kartik, Carnegie Mellon University, USA
Tian, Gui Yun, University of Newcastle, UK
Tsiantos, Vassilios, Technological Educational Institute of Kaval, Greece
Tsigara, Anna, National Hellenic Research Foundation, Greece
Twomey, Karen, University College Cork, Ireland
Valente, Antonio, University, Vila Real, - U.T.A.D., Portugal
Vanga, Raghav Rao, Summit Technology Services, Inc., USA
Vaseashta, Ashok, Marshall University, USA
Vazquez, Carmen, Carlos III University in Madrid, Spain
Vieira, Manuela, Instituto Superior de Engenharia de Lisboa, Portugal
Vigna, Benedetto, STMicroelectronics, Italy
Vrba, Radimir, Brno University of Technology, Czech Republic
Wandelt, Barbara, Technical University of Lodz, Poland
Wang, Jiangping, Xi'an Shiyou University, China
Wang, Kedong, Beihang University, China
Wang, Liang, Pacific Northwest National Laboratory, USA
Wang, Mi, University of Leeds, UK
Wang, Shinn-Fwu, Ching Yun University, Taiwan
Wang, Wei-Chih, University of Washington, USA
Wang, Wensheng, University of Pennsylvania, USA
Watson, Steven, Center for NanoSpace Technologies Inc., USA
Weiping, Yan, Dalian University of Technology, China
Wells, Stephen, Southern Company Services, USA
Wolkenberg, Andrzej, Institute of Electron Technology, Poland
Woods, R. Clive, Louisiana State University, USA
Wu, DerHo, National Pingtung Univ. of Science and Technology, Taiwan
Wu, Zhaoyang, Hunan University, China
Xiu Tao, Ge, Chuzhou University, China
Xu, Lisheng, The Chinese University of Hong Kong, Hong Kong
Xu, Sen, Drexel University, USA
Xu, Tao, University of California, Irvine, USA
Yang, Dongfang, National Research Council, Canada
Yang, Shuang-Hua, Loughborough University, UK
Yang, Wuqiang, The University of Manchester, UK
Yang, Xiaoling, University of Georgia, Athens, GA, USA
Yaping Dan, Harvard University, USA
Ymeti, Aurel, University of Twente, Netherland
Yong Zhao, Northeastern University, China
Yu, Haihu, Wuhan University of Technology, China
Yuan, Yong, Massey University, New Zealand
Yufera Garcia, Alberto, Seville University, Spain
Zakaria, Zulkarnay, University Malaysia Perlis, Malaysia
Zagnoni, Michele, University of Southampton, UK
Zamani, Cyrus, Universitat de Barcelona, Spain
Zeni, Luigi, Second University of Naples, Italy
Zhang, Minglong, Shanghai University, China
Zhang, Quintao, University of California at Berkeley, USA
Zhang, Weiping, Shanghai Jiao Tong University, China
Zhang, Wenming, Shanghai Jiao Tong University, China
Zhang, Xueji, World Precision Instruments, Inc., USA
Zhong, Haoxiang, Henan Normal University, China
Zhu, Qing, Fujifilm Dimatix, Inc., USA
Zorzano, Luis, Universidad de La Rioja, Spain
Zourob, Mohammed, University of Cambridge, UK

Contents

Volume 146
Issue 11
November 2012

www.sensorsportal.com

ISSN 1726-5479

Research Articles

- Diffusion in Carbon Nanotubes: Details, Characteristics, Comparisons at Nanolevel**
Paolo Di Sia 1
- Synthesis Characterization and Humidity Sensing Properties of Sol-gel Derived Novel Nanomaterials of $\text{LaSr}_x\text{Fe}_{1-x}\text{O}_{3-\delta}$**
Mary Teresita V., Jeseentharani V., Avila Josephine B., Jeyaraj B., Arul Antony S. 8
- Gas Sensing Characteristics of ZnO Nanowires Fabricated by Carbothermal Evaporation Method**
Roghayeh Imani and Mohammad Orvatinia 17
- In-Situ Decoration of Electrostatically Functionalized Multiwalled Carbon Nanotubes with $\beta\text{-Ni(OH)}_2$ Nanoparticles for Low Temperature NO_2 Detection**
Richa Saggar, Vasuda Bhatia, Prashant Shukla, Nitin Bhardwaj, Vinod K Jain 28
- Synthesis and Characterization of ZnO Nanoparticles as Prepared by Gel-combustion and ZnO Nanomorphologies by Sol-gel**
Mario F. Bianchetti, Marjeta Maček-Krzmanc, Ines Bracko, Sreco D. Skapin and Noemi E. Walsøe de Reca 36
- Multiwalled Carbon Nanotubes Reinforced Cement Composite Based Room Temperature Sensor for Smoke Detection**
Prashant Shukla, Vasuda Bhatia, Vikesh Gaur, Nitin Bhardwaj, Vinod Kumar Jain 48
- A Facile and Green Synthesis of Small Silver Nanoparticles in β -cyclodextrins Performing as Chemical Microreactors and Capping Agents**
Giorgio Ventimiglia and Alessandro Motta 59
- Electrostatically Functionalized Multi-Walled Carbon Nanotubes Based Flexible and Non-Enzymatic Biosensor for Glucose Detection**
Bhawana Singh, Vasuda Bhatia, V. K. Jain 69
- Amperometric Acetylcholinesterase Biosensor Based on Poly (Diallyldimethylammonium Chloride)/Gold Nanoparticles/Multi-walled Carbon Nanotubes-chitosans Composite Film-modified Electrode**
Xia Sun, Zhili Gong, Yaoyao Cao, Xiangyou Wang 78
- Structural, Morphological and Optical Properties of Spray Deposited Nano-crystalline CdO Thin Films**
Maqbul A. Barote, Elahipasha U. Masumdar 90
- A Novel Amperometric Immunosensor Based on $\{\text{MWCNTs-COOH-CHIT}\}_2/\text{GNPs}$ for Detection of Chlorpyrifos**
Xia Sun, Lu Qiao, Xiangyou Wang 96

Y³⁺ Added Nanocrystallite Mg-Cd Ferrite LPG, Cl₂ and C₂H₅OH Sensors <i>Ashok B. Gadkari, Tukaram J. Shinde, Pramod N. Vasambekar.....</i>	110
Immunosensor Based on Gold Nanoparticles-multi-walled Carbon Nanotubes-chitosans Composite and Prussian Blue for Detection of Chlorpyrifos <i>Xia Sun, Falan Li, Xiangyou Wang.....</i>	121
Nanostructured CdFe₂O₄ Thick Film Resistors as Ethonal Gas Sensors <i>S. V. Bangale, R. D. Prakshale, S. R. Bamane.....</i>	133
A Novel Combustion Route for the Preparation of Nanocrystalline LaAlO₃ Oxide Based Electronic Nose Sensitive to NH₃ at Room Temperature <i>K. A. Khamkar, S. V. Bangale, V. V. Dhapte, D. R. Patil, S. R. Bamane.....</i>	145
Gold Nanoparticle Amplification Combined with Quartz Crystal Microbalance DNA Based Biosensor for Detection of <i>Mycobacterium Tuberculosis</i> <i>Thongchai Kaewphinit, Somchai Santiwatanakul and Kosum Chansiri.....</i>	156
Structural, Morphological and Optical Properties of Spray Deposited Nanocrystalline ZnO Thin Films: Effect of Nozzle to Substrate Distance <i>Elahipasha U. Masumdar, Maqbul A. Barote.....</i>	164
Zinc and Pyrrole-added Akaganeite (β-FeOOH) Films by Ultrasonic Spray Pyrolysis Assessed as Propane Sensors <i>Carlos Torres Frausto, Alejandro Avila-Garcia.....</i>	170
Potentiometric Determination of Low Content of Water in Different Organic Solvents Using NASICON Based Probe <i>Parul Yadav and M. C. Bhatnagar.....</i>	182
Development of Electrochemical Sensors for the Detection of Mercury by CNT/Li⁺, C₆₀/Li⁺ and Activated Carbon Modified Glassy Carbon Electrode in Blood Medium <i>Muhammed M. Radhi, Dawood S. Dawood, Nawfal K. Al-Damlooji and Tan W. Tee.....</i>	191

Authors are encouraged to submit article in MS Word (doc) and Acrobat (pdf) formats by e-mail: editor@sensorsportal.com
Please visit journal's webpage with preparation instructions: <http://www.sensorsportal.com/HTML/DIGEST/Submission.htm>

International Frequency Sensor Association (IFSA).

Promoted by IFSA

Gyroscopes and IMUs for Defense, Aerospace & Industrial Report up to 2017

This report highlights market share analysis by application field and technology,
as well as global company shipments and technology breakdown

Order online:
http://www.sensorsportal.com/HTML/Gyroscopes_and_IMUs_markets.htm



The Fourth International Conference on Sensor Device Technologies and Applications

SENSORDEVICES 2013

25 - 31 August 2013 - Barcelona, Spain

Tracks: Sensor devices - Ultrasonic and Piezosensors - Photonics - Infrared - Gas Sensors - Geosensors - Sensor device technologies - Sensors signal conditioning and interfacing circuits - Medical devices and sensors applications - Sensors domain-oriented devices, technologies, and applications - Sensor-based localization and tracking technologies - Sensors and Transducers for Non-Destructive Testing

Deadline for papers: 30 March 2013

<http://www.iaria.org/conferences2013/SENSORDEVICES13.html>



The Seventh International Conference on Sensor Technologies and Applications

**Deadline for papers:
30 March 2013**

SENSORCOMM 2013

25 - 31 August 2013 - Barcelona, Spain

Tracks: Architectures, protocols and algorithms of sensor networks - Energy, management and control of sensor networks - Resource allocation, services, QoS and fault tolerance in sensor networks - Performance, simulation and modelling of sensor networks - Security and monitoring of sensor networks - Sensor circuits and sensor devices - Radio issues in wireless sensor networks - Software, applications and programming of sensor networks - Data allocation and information in sensor networks - Deployments and implementations of sensor networks - Under water sensors and systems - Energy optimization in wireless sensor networks

<http://www.iaria.org/conferences2013/SENSORCOMM13.html>



The Sixth International Conference on Advances in Circuits, Electronics and Micro-electronics

CENICS 2013

25 - 31 August 2013 - Barcelona, Spain

Deadline for papers: 30 March 2013

Tracks: Semiconductors and applications - Design, models and languages - Signal processing circuits - Arithmetic computational circuits - Microelectronics - Electronics technologies - Special circuits - Consumer electronics - Application-oriented electronics

<http://www.iaria.org/conferences2013/CENICS13.html>

Synthesis Characterization and Humidity Sensing Properties of Sol-gel Derived Novel Nanomaterials of $\text{LaSr}_x\text{Fe}_{1-x}\text{O}_{3-\delta}$

¹ Mary Teresita V., ² Jeseentharani V., ¹ Avila Josephine B.,
² Jeyaraj B., ³ Arul Antony S.

¹Department of Chemistry, Stella Maris College, Chennai-600 086, India

³ PG & Research Department of Chemistry, Presidency College, Chennai-600 005, India

²Department of Chemistry, Loyola Institute of Frontier Energy (LIFE),
Loyola College, Chennai - 600 034, India

¹ Tel: +91 9840224515

E-mail: teres_cvd@yahoo.co.in

Received: 10 September 2012 /Accepted: 23 November 2012 /Published: 30 November 2012

Abstract: $\text{LaSr}_x\text{Fe}_{1-x}\text{O}_{3-\delta}$ ($x=0, 0.2, 0.4, 0.6, 0.8, 1$) were prepared by sol-gel method. The compounds were sintered at 700 °C for 6 hrs and were subjected to DC resistance measurements at RH 5-98 % and temperature dependent studies. The change in surface conductivity as a function of applied field was measured using picoammeter (Keithely-6485). Among the various mole ratios of compounds LSF-4 shows the highest sensitivity factor of 2.606×10^4 and LSF-1 shows the lowest sensitivity factor 0.426×10^2 . Response and recovery times were measured. The compounds were characterized by X-ray diffraction, FT-IR and scanning electron microscopy (SEM) studies were employed to study the structural phases, vibrational frequencies, surface morphology of the highest humidity sensing compounds. Copyright © 2012 IFSA.

Keywords: Mixed metal oxides, Sensors, Perovskites, Ferrite, Humidity.

1. Introduction

Chemical sensors have attracted considerable attention in past decades due to their wide applications in air quality control, environmental protection and health care as well as security [1-3]. Many efforts have been taken in the investigations of high performance chemical sensors with high sensitivity, rapid speed, reproducibility, durability and broad range operation. Thus researchers have done to

develop new materials and devices [4, 5] for example adding catalyst [6], doping metals [7] and metal oxides [8].

Humidity sensors are in great demand for quality control of production process and products a wide range of industries, such as production of electronic devices, precision instruments, textiles and foodstuffs [9] and also in many domestic applications, such as smart control of living environmental in a building. A wide variety of materials have been studied and used as sensing elements in a humidity measurement device. Amongst them ceramic oxides have shown advantages terms of thermal, physical and chemical stability and mechanical strength [10-12]. The desirable characteristics of humidity sensors are high sensitivity, chemical and thermal stability, no hysteresis, low cost and long life.

The ceramic oxides crystallize in different structures e.g. Rock salt, Wurtzite, Spinel, Zinc blende, Rutile, Fluorite, Countum, Perovskite etc., Among them Perovskite type oxides (general formula ABO_3) have attracted much attention in recent years, because their electronic properties and hence sensing behavior of these oxides may be modified by an appropriate substitutions of cations at the A and B sites [13]. These in the form of bulk thick or thin films are being used as multifunctional sensor i.e. sensing temperature, gas and humidity [14, 15].

In the present investigation a novel nano structured $LaSr_xFe_{1-x}O_{3-\delta}$ ($x=0$ to 1) which was prepared by sol-gel method reveals both excellent humidity and thermal sensitivity properties. The novelty of this material is achieved by preparing the mixed metal oxide has a single phase compound which is done by sintering the samples for 8 hours at 800 °C in tubular furnace. This supported by the XRD reports. The material is characterized by SEM, XRD, and IR. The humidity dependent electrical properties of Perovskite oxide $LaSr_xFe_{1-x}O_{3-\delta}$ have been studied by preparing different mole ratios of $LaSr_xFe_{1-x}O_{3-\delta}$ by altering the addition of Fe^{3+} with Sr^{2+} . It is reported that this material is considered to be a potential candidate for oxygen separation membranes as the material reported interesting electrical properties. It has been found in the humidity sensing studies that the material shows high sensitive factor by the substitution of Fe^{3+} with Sr^{2+} due to the change in the surface morphology of the material. Electrical conductance can occur through internal surface layers of adsorbed water [16], the tiny pores can fill with water as determined by the Kelvin equation [17] leading to electrolytic conduction through the moisture or the conductance of the semiconductor itself can change due to an interaction of its surface energy states with hydroxyl radicals, especially at the grain boundaries [18, 19].

2. Experimental Procedure

2.1. Sample Preparation

Sol-gel method: A known amount of citric acid and ethylene glycol (AR) were mixed well by keeping it over a magnetic stirrer for 10 minutes around 150 °C and to this the dissolved nitrate solutions of $La(NO_3)_3$, $Fe(NO_3)_3$ and $Sr(NO_3)_2$ of appropriate mole ratios were added and stirred for 30 minutes and the mixture was heated to 150 °C till powder form is obtained.

The resulting LSF compounds were compacted to pellet at a pressure of 4 ton/sq.inch. The diameter of the pellet is 13 mm and the thickness is 2 mm. These solid pellets were sintered at 700 °C for 6 hrs in ambient air atmosphere. The samples were cooled down to room temperature at the natural cooling rate of the furnace. As the concentration of strontium increased at particular level was shown to enhance the sensitivity of humidity sensors. Since our interest is to prepare a nanomaterial the compounds were synthesized specifically by sol-gel method.

2.2. Characterization and Humidity Sensing Studies

Controlled humidity environments of relative humidity 5, 31, 51, 79 and 98 % were achieved by using anhydrous P₂O₅, saturated aqueous solution of CaCl₂.6H₂O, Ca(NO₃)₂.4H₂O, NH₄Cl and CuSO₄.5H₂O in a closed desiccators at an ambient temperature of 298 K. Prior to the saturation of the pellets in the above buffers, the pellets were heated at 393K for 12 hrs to remove the adsorbed water. A degassed chamber of about 200 cm³ was used for evaluating the response and recovery characteristics. This chamber has a provision for two-way inlet, one for transpiring the dry air and the other for moist air from a wet candle. Air drying was accomplished by transpiring the air stream through drying columns packed with anhydrous CaCl₂ and dry P₂O₅ connected in series. The resistance measurements in the dry air as well as in moist air alternatively helped to establish the response and recovery time of the compounds.

The DC electrical resistance at different relative humidity levels of the samples in the form of pellets was determined by a two- probe method as the present work is to measure the changes in surface conductivity as a function of applied field and current. The electrical contacts were made on the surface of the pellet by means of two thin copper wires affixed with silver paint. Given the high resistivity of the materials under investigation, the potential inaccuracy due to contact resistance is assumed negligible. The pellet was inserted in the middle of the Pyrex tube of 5cm diameter on which kanthal wire was uniformly wounded externally. The kanthal wire ends were connected to avarian to vary the temperature and a copper –constantan thermocouple kept at the pellet was used to measure the temperature of the sample. The electrodes were connected to DC power supply and the Keithley 6485 picoammeter in series. The temperature dependent conductance experiments in the temperature range of 120- 300 °C under ambient conditions were carried out to determine the activation energies for electrical conduction of the samples using linearised form of the expression

$$I=I_0 \exp^{-E_a/kT}, \quad (1)$$

where I is the current, E_a is the activation energy, k is the Boltzmann constant and T is the temperature.

The structural studies were carried out using a Philips X'pert diffractometer for 2θ values ranging from 10 to 80° using CuKα radiation at λ =1.54 Å. The Fourier transform infrared (FT-IR) spectra were recorded with Perkin – Elmer spectrometer using KBr pellets whose thickness was about 1.3 mm. Each spectrum was collected at room temperature under the atmospheric pressure. The samples were dispersed in spectroscopic grade KBr pellets and were scanned in the range of 4000-400 cm⁻¹.

The surface morphology of the samples was observed on a JSM -6360 SEM analyzer operating at an accelerating voltage of 15 kV using gold coated samples.

3. Results and Discussion

3.1. X-Ray Diffraction Studies

The powder XRD patterns of LSF 1 to 6 compounds (Fig. 1) showed the characteristic peaks corresponding to LaSr_xFe_{1-x}O_{3-δ} confirming the absence of impurities and presence of mixed oxide intermediate peaks of new phases in LSF-2 to LSF-5. The XRD pattern of LSF-1 compound (JCPDS- 75-0541) data corresponds to pure lanthanum ferrite which is cubic and LSF-6 which is also cubic confirmed with JCPDS data's. The XRD pattern of compounds LSF-2 to LSF-5 were studied by comparing LSF-1 and LSF-6 the uniqueness of these XRD patterns is a proof that the compounds LSF-2 to LSF-5 is of novel.

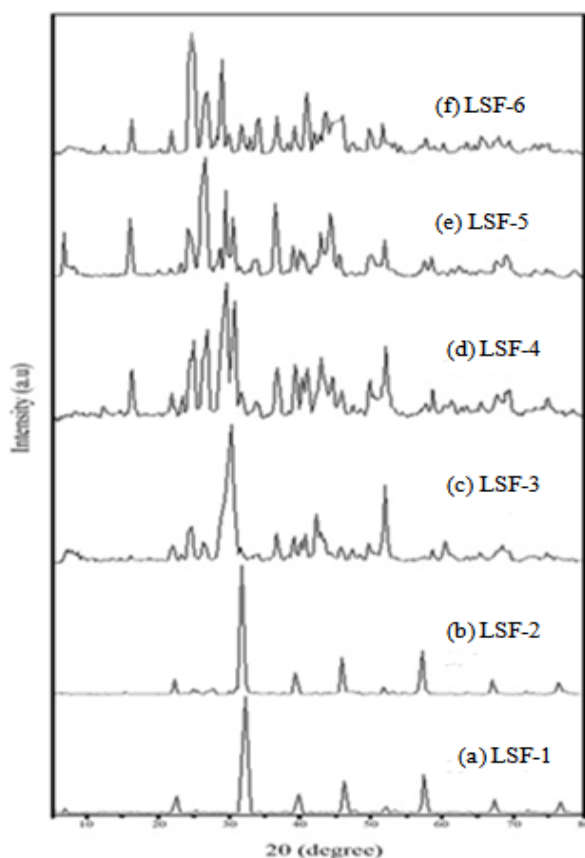


Fig. 1. XRD patterns of LSF-1 to LSF-6 compounds.

3.2. FT-IR Spectroscopy

The FT-IR spectra of LSF-1 to LSF-6 nano compounds (Fig. 2) showed spectral bands from 1000 to 400 cm^{-1} corresponds to metal oxide stretching vibrations of La-O, Sr-O and Fe-O bonds present in the compound. Since these nano compounds LSF-1 to LSF-6 is of novel they exist as overlapping peaks of La-O, Sr-O and Fe-O. The common broad band near 3448 and 1650 cm^{-1} observed were assigned to $\nu(\text{HO}^-)$ and $\delta(\text{H}_2\text{O})$ [20, 21]. The FT-IR spectra of LSF-4 compound has broader band around 3400 cm^{-1} and 1600 cm^{-1} indicating more adsorption capacity for water than other compounds.

3.3. Scanning Electron Microscopy (SEM)

Fig. 3 (a-d) shows the intergranular porous structure of the sample material qualitatively. The micrographs of LSF-1 and LSF-6 (Fig. 3 a, b) is of the pure lanthanum ferrite with the particle size $1\text{ }\mu\text{m}$ and pure lanthanum strontium oxide with the particle size $20\text{ }\mu\text{m}$, which doesn't show much of porosity. The LSF-4 and LSF-5 (Fig. 3 c, d) is of the mixed metal oxides of lanthanum iron and strontium oxide which is formed as a compound by the sol-gel method. The particle size of LSF-4 is $130\text{-}180\text{ nm}$ and that of LSF-5 is $165\text{-}240\text{ nm}$. On comparing the micrographs LSF-4 shows a larger grain size and decrease in the particle size than LSF-1, LSF-5 and LSF-6. The LSF-4 contains 0.4 moles of Fe^{3+} and 0.6 mole Sr^{2+} and LSF-5 contains 0.2 mole of Fe^{3+} and 0.8 mole of Sr^{2+} . When compared with LSF-1, LSF-5 and LSF-6 with LSF-4 shows porous nature of the compound. The morphology is well defined in the LSF-4 than in LSF-1, LSF-5 and LSF-6. The addition of 0.8 moles of strontium in the lanthanum ferrite matrix of LSF-5 reduces the grain size of the particles with the formation of intergranular pores that leads to micro porosity in addition to the presence of mesopores. Furthermore, it is observed the addition of 0.6 moles of strontium reduces the grain size and increases

the pore size in LSF-4. The well developed porosity in the nanostructure LSF-4 is very important in humidity sensing studies.

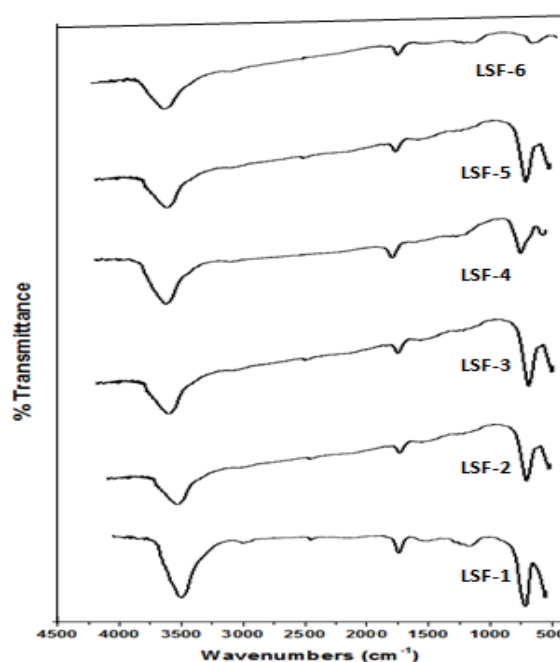


Fig. 2. FT-IR spectra of LSF-1 to LSF-6 compounds.

3.5. Humidity Measurements

In humidity sensing measurements, all the LSF compounds showed a decrease in resistance with an increase in % RH. The resistance changes in porous Perovskite type oxides with increasing of the humidity level occur because of adsorption and capillary condensation of water. The optimum concentration of $x=0.4$ mole ratio shows good sensor towards humidity. The LSF-4 compound showed a highest humidity sensitivity of 2606 with a resistance of $1.48 \times 10^{10} \Omega$ at RH 5 % and $5.68 \times 10^6 \Omega$ at RH 98 %. At low humidity levels, chemisorptions takes place, leading to formation of free surface hydroxyls with the charge transport occurring by the hopping mechanism [22]. While at high humidity levels, water is physisorbed on the top of the chemisorbed layer. As a result, the condensation of water in the capillary like pores leads to a liquid like layer leading to electrolytic conduction. The increase in porosity as evidenced from SEM images confirms the presence of more sites for water adsorption in LSF-4 compound. The SEM micrographs also reveal that the LSF-4 compound produces fine grains with maximum porosity compared with the other, indicating that the smaller the grain size, the higher the surface energy and the adsorption capacity. The sintered porous semiconductor has a large internal surface area for the adsorption of water vapor. The sensitivity of the compounds with various molar ratios of LSF-1 to LSF-6 is shown in Table 1.

Further the coordination of water molecule to Fe ions in LSF-1 to LSF-6 compounds increase the acidity thereby release of H^+ . Good linearity in the $\log R$ versus RH % plot is an important criterion for good humidity sensitivity material (see Fig. 4). The results suggest that the more linear the plot, the better the response, recovery and sensitivity of the material. The LSF-1 with the humidity sensitivity factor of 43 has a resistance of $1.03 \times 10^{10} \Omega$ at RH 5 % and $2.42 \times 10^8 \Omega$ at RH 98 %. The LSF-6 with the humidity sensitivity factor of 438 has a resistance of $5.48 \times 10^{10} \Omega$ at RH 5 % and $1.25 \times 10^8 \Omega$ at RH 98 % due to fewer sites for water adsorption on the ceramic surface compared to that of LSF-4 compound.

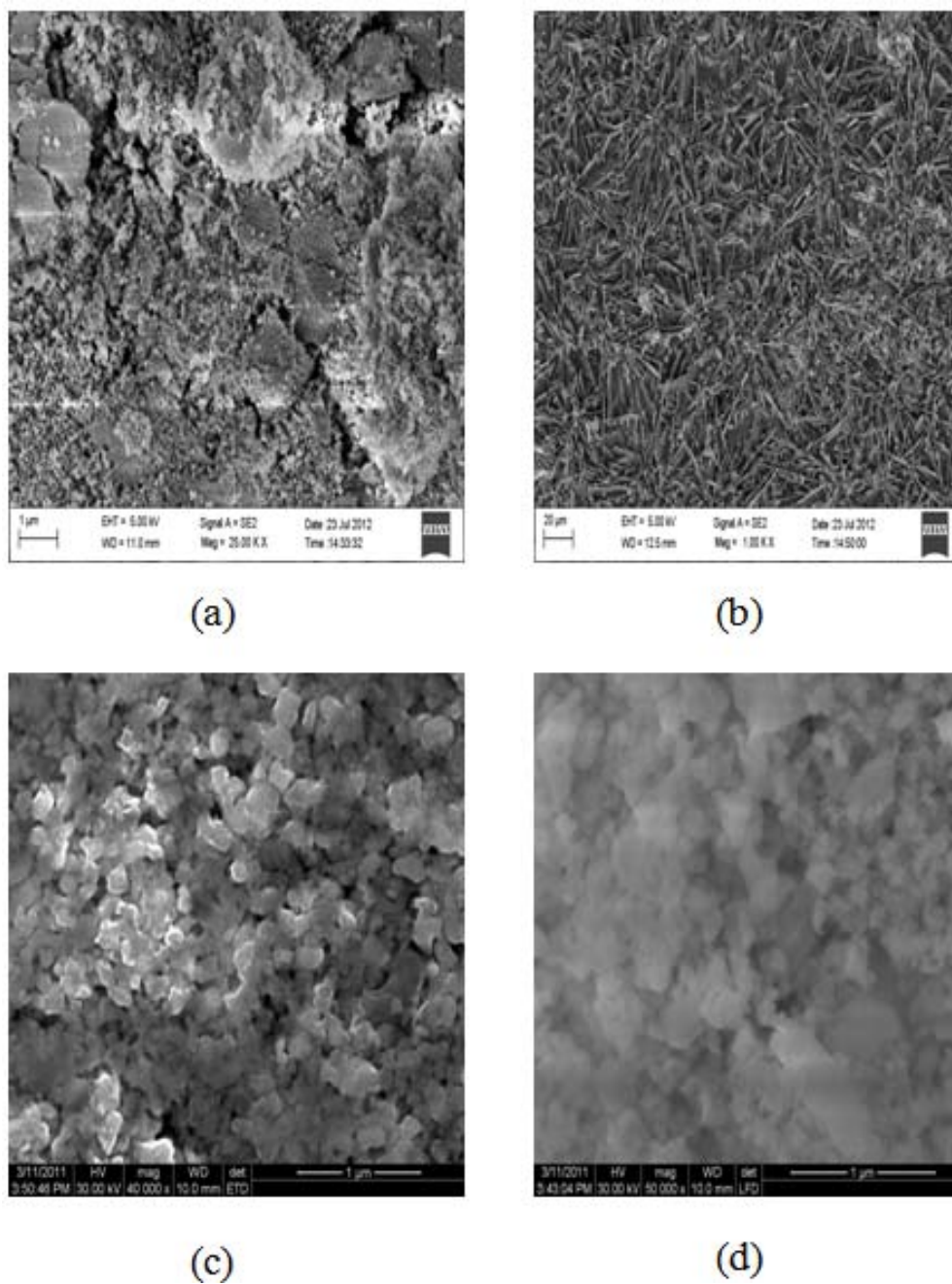


Fig. 3. SEM micrographs of a) LSF-1; b) LSF- 6; c) LSF-4, and d) LSF-5.

Table 1. Resistance at RH 5 % and RH 98 %, Sensitivity factor, Energy of activation of LSF compounds.

Sample Codes	$R(\Omega)$, at RH 5%	$R(\Omega)$, at RH 98%	S_f ($R_{RH\ 5\%}/R_{RH\ 98\%}$)	E_a
LSF-1	1.03×10^{10}	2.42×10^8	42.6	0.094
LSF-2	4.20×10^{10}	4.72×10^7	889.8	0.051
LSF-3	3.47×10^{11}	2.98×10^8	1164.4	0.043
LSF-4	1.48×10^{10}	5.68×10^6	2605.6	0.034
LSF-5	4.08×10^{10}	4.44×10^7	918.9	0.049
LSF-6	5.48×10^{10}	1.25×10^8	438.4	0.040

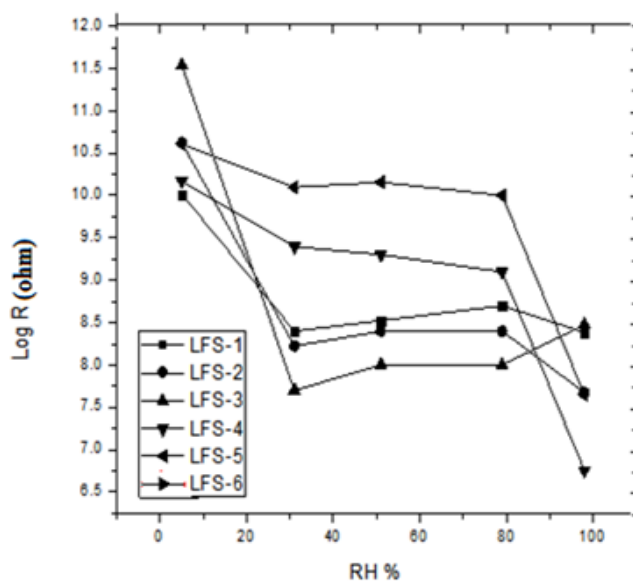


Fig. 4. Plots of log R vs. RH% for LSF-1 to LSF-6 compounds.

3.6. Temperature Dependent Studies

The electrical conductance measurements of LSF-1 to LSF-6 compounds at room temperature prior to relative humidity measurements signified that the current increased linearly with the applied voltage, indicating the ohmic contact of the electrodes. The temperature dependence of the electrical conductance carried out in the temperature range 120 °C to 350 °C suggested that the current (I) increased with an increase in temperature (T). The activation energies calculated from the temperature dependence of conductance data are also shown in Table 1. The activation energy for electrical conduction in polycrystalline materials generally involves the combination of the energy required to raise the carriers from the dominant levels to their corresponding transport bands and the energy required to create the carriers in the dominant levels [23]. The low activation energy of LSF-4 compound predicts that the small polaron conduction dominates in the studied temperature range.

3.6. Response and Recovery Characteristics

The response and recovery time obtained plots of Log R vs. Time (Fig. 5.) for LSF-4 were found to be 190 s and 80 s, respectively. The longer time taken for the restoration of the resistance to that in dry air could be understood by the fact that these experiments are conducted at 25 °C at which temperature the desorption kinetics is expected to be slow thus evidencing a surface controlled phenomena.

The response and recovery of the LSF-4 compound was further supported by the stability of the compound which is obtained by plotting Resistance vs. Days. From Fig. 6 it was found that there is no much variation in the resistance even after studying the sample after two to three months duration. This accounts for the stability of the LSF-4 compound.

Conclusion

The LSF ($\text{LaSr}_x\text{Fe}_{1-x}\text{O}_{3.8}$) compounds with different mole ratios $x = 0, 0.2, 0.4, 0.6, 0.8, 1.0$ were prepared by sol-gel method and their purity was confirmed by XRD analysis. The intensity of XRD

peaks shows a variation from LSF-2 to LSF-5 due to the presence of La^{3+} , Fe^{3+} and Sr^{2+} . The novelty of the compound has been proved by the XRD patterns which is different from the existing phases. The morphology of the compounds was studied by the SEM micrographs. FT-IR study showed the characteristic metal oxide vibrational frequencies. The LSF-4 ($\text{LaSr}_{0.6}\text{Fe}_{0.4}\text{O}_{3-\delta}$) compound showed the highest humidity sensitivity factor of 2.606×10^4 . Temperature dependent studies showed the low activation energy of the entire compound confirming the involvement of small polaron hopping mechanism in the conduction. The good response and recovery time of LSF-4 compound and its highest sensitivity factor might be a promising humidity sensing material for practical application.

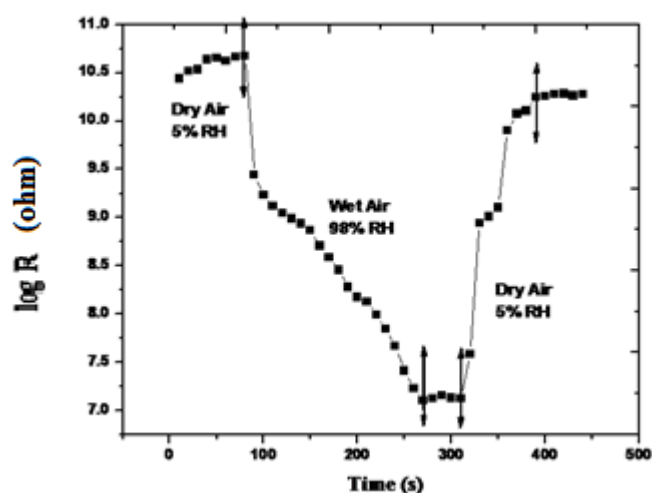


Fig. 5. Response and Recovery plots of LSF-4 compound.

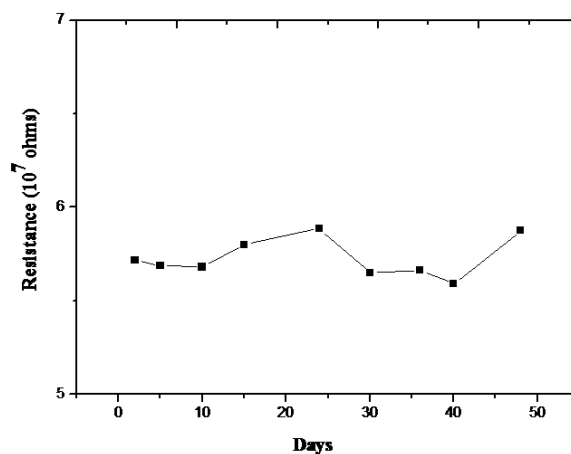


Fig. 6. Stability plot of LSF-4 compound.

Acknowledgements

The authors would like to thank the Head of Loyola College, the Director of Loyola Institute of Frontier Energy (LIFE) and the Head of Stella Maris College for giving permission to use the instruments and other facilities.

References

- [1]. S. Zampolli, I. Elmi, F. Ahmed, M. Passini, G. C. Cardinali, S. Nicoletti, L. Dori, Selectivity enhancement of metal oxide gas sensors using a micromachined gas chromatographic column, *Sens. Actuators B: Chem.*, 105, 2005, pp. 400-406.
- [2]. S. Ehrmann, J. Jungst, J. Goschnick, D. Everhard, Application of a gas sensor microarray to human breath analysis, *Sens. Actuators B: Chem.*, 65, 2000, pp. 247-249.
- [3]. A. A. Tomchenko, G. P. Harmer, B. T. Marquis, Detection of chemical warfare agents using nanostructured metal oxide sensors, *Sens. Actuators B: Chem.*, 108, 2005, pp. 41-55.
- [4]. K. S. Chou, T. K. Lee, F. J. Liu, Sensing mechanism of a porous ceramic as humidity sensor, *Sens. Actuators B: Chem.*, 56, 1999, pp. 106-111.
- [5]. J. Kong, N. R. Franklin, C. Zhou, M. G. Chapline, S. Peng, K. Cho, H. Dai, Nanotube molecular wires as chemical sensors, *Science*, 287, 2000, pp. 622-625.
- [6]. A. Kolmakov, D. O. Klenov, Y. Lilach, S. Stemmer, M. Moskovits, Enhanced gas sensing by individual SnO₂ nanowires and nanobelts functionalized by with Pd catalyst particles, *Nano Lett.*, 5, 2005, pp. 667-673.
- [7]. Z. Zhang, C. Hu, Y. Xiong, R. Yang, Z. Wang, Synthesis of Ba-doped CeO₂ nanowires and their application as humidity sensors, *Nanotechnology*, 18, 2007, pp. 465504.
- [8]. M. K. Jain, M. C. Bhatnagar, G. L. Sharma, Electric circuit model for MgO-doped ZrO₂-TiO₂ ceramic humidity sensor, *Appl. Phys. Lett.*, 73, 1998, pp. 3854-3856.
- [9]. A. Arai, T. Seiyama, in: W. Gopel, J. Hesse, J. N. Zemel (Eds.), *Sensor: a Comprehensive Survey*, Vol. 2, VCH, Weinheim, 1992, p. 981, Ch. 20.
- [10]. E. Traversa, Ceramic sensors for humidity detection: the state-of-the-art and future developments, *Sens. Actuators B*, 23, 1995, pp. 135-156.
- [11]. H. Yagi, Humidity sensor using ceramic materials, in: M. Buller, A. Ricco, N. Yamazoe (Eds.), in *Proc. of the Symp. on Chemical Sensor II*, Vol. 93-97, *The Electro Chemical Society*, Penginton, NJ, 1993, p. 498.
- [12]. W. Qu, J. U. Meyer, A novel thick-film ceramic humidity sensor, *Sens. Actuators B*, 40, 1997, pp. 175-182.
- [13]. B. Li, P. T. Lai, S. H. Zhang, M. Q. Huang, Effects of ceramic-film thickness on humidity sensitivity of Al/Ba_{1-x}La_xNb_yTi_{1-y}O₃/SiO₂/Si structure, *Smart Materials and Structures*, 9, 2000, pp. 498.
- [14]. Z. Zhigang, Z. Gang, Thin films of non-stoichiometric perovskites as potential oxygen sensors, *Ferroelectric* 101, 1990, pp. 43.
- [15]. W. Qu, R. Green, M. Austin, Development of multi-functional sensors in thick-film and thin-film Technology, *Measurement Science & Technology*, 11, 2000, pp. 1111.
- [16]. J. H. Anderson, G. A. Parks, The electrical conductivity of silica gel in the presence of adsorbed water, *J. Phys. Chem.*, 72, 1968, pp. 3662-3668.
- [17]. T. Seiyama, N. Yamazoe, H. Arai, Ceramic humidity sensors, *Sens. Actuators B*, 4, 1983, pp. 85-96.
- [18]. S. L. Yang, J. M. Wu, ZrO₂-TiO₂ ceramic humidity sensors, *J. Mater. Sci.*, 26, 1991, pp. 631-636.
- [19]. J. L. Zhang, Electrical conduction of Ba_{0.5}Sr_{0.5}TiO₃ ceramics under d.c. voltage, *J. Mater. Sci. Lett.*, 11, 1992, pp. 294-295.
- [20]. D. Dvoranova, V. Nrezova, M. Mazur, M. A. Malati, Investigations of metal doped titanium dioxide photocatalysts, *Appl. Catal. B: Environ.*, 37, 2002, pp. 91-105.
- [21]. M. F. Zawrah, Investigation of lattice constant, sintering properties of nano Mg-Al spinels, *Mater. Sci. Eng. A*, 382, 2004, pp. 362-370.
- [22]. S. Pokhrel, K. S. Nagaraja, Electrical and humidity sensing properties of molybdenum (VI) oxide and tungsten (VI) oxide composites, *Phy. Stat. Sol., A*, 198, 2, 2003, pp. 343-349.
- [23]. Z. A. Ansari, T. G. Ko, J. H. Oh, Humidity sensing behaviour of thick films of strontium-doped lead-zirconium-titanate, *Surf. Coat. Technol.*, 179, 2004, pp. 182-187.



International Frequency Sensor Association Publishing Call for Books Proposals

Sensors, MEMS, Measuring instrumentation, etc.



Benefits and rewards of being an IFSA author:

1

Royalties

Today IFSA offers most high royalty in the world: you will receive 50 % of each book sold in comparison with 8-11 % from other publishers, and get payment on monthly basis compared with other publishers' yearly basis.

2

Quick Publication

IFSA recognizes the value to our customers of timely information, so we produce your book quickly: 2 months publishing schedule compared with other publishers' 5-18-month schedule.

3

The Best Targeted Marketing and Promotion

As a leading online publisher in sensors related fields, IFSA and its Sensors Web Portal has a great expertise and experience to market and promote your book worldwide. An extensive marketing plan will be developed for each new book, including intensive promotions in IFSA's media: journal, magazine, newsletter and online bookstore at Sensors Web Portal.

4

Published Format: printable pdf (Acrobat).

When you publish with IFSA your book will never go out of print and can be delivered to customers in a few minutes.

You are invited kindly to share in the benefits of being an IFSA author and to submit your book proposal or/and a sample chapter for review by e-mail to editor@sensorsportal.com. These proposals may include technical references, application engineering handbooks, monographs, guides and textbooks. Also edited survey books, state-of-the-art or state-of-the-technology, are of interest to us. For more detail please visit: http://www.sensorsportal.com/HTML/IFSA_Publishing.htm



International Frequency Sensor Association (IFSA) Publishing

Digital Sensors and Sensor Systems: Practical Design

Sergey Y. Yurish



Formats: printable pdf (Acrobat) and print (hardcover), 419 pages

ISBN: 978-84-616-0652-8,
e-ISBN: 978-84-615-6957-1

The goal of this book is to help the practitioners achieve the best metrological and technical performances of digital sensors and sensor systems at low cost, and significantly to reduce time-to-market. It should be also useful for students, lectures and professors to provide a solid background of the novel concepts and design approach.

Book features include:

- Each of chapter can be used independently and contains its own detailed list of references
- Easy-to-repeat experiments
- Practical orientation
- Dozens examples of various complete sensors and sensor systems for physical and chemical, electrical and non-electrical values
- Detailed description of technology driven and coming alternative to the ADC a frequency (time)-to-digital conversion

Digital Sensors and Sensor Systems: Practical Design will greatly benefit undergraduate and at PhD students, engineers, scientists and researchers in both industry and academia. It is especially suited as a reference guide for practitioners, working for Original Equipment Manufacturers (OEM) electronics market (electronics/hardware), sensor industry, and using commercial-off-the-shelf components

http://sensorsportal.com/HTML/BOOKSTORE/Digital_Sensors.htm

Guide for Contributors

Aims and Scope

Sensors & Transducers Journal (ISSN 1726-5479) provides an advanced forum for the science and technology of physical, chemical sensors and biosensors. It publishes state-of-the-art reviews, regular research and application specific papers, short notes, letters to Editor and sensors related books reviews as well as academic, practical and commercial information of interest to its readership. Because of it is a peer reviewed international journal, papers rapidly published in *Sensors & Transducers Journal* will receive a very high publicity. The journal is published monthly as twelve issues per year by International Frequency Sensor Association (IFSA). In addition, some special sponsored and conference issues published annually. *Sensors & Transducers Journal* is indexed and abstracted very quickly by Chemical Abstracts, IndexCopernicus Journals Master List, Open J-Gate, Google Scholar, etc. Since 2011 the journal is covered and indexed (including a Scopus, Embase, Engineering Village and Reaxys) in Elsevier products.

Topics Covered

Contributions are invited on all aspects of research, development and application of the science and technology of sensors, transducers and sensor instrumentations. Topics include, but are not restricted to:

- Physical, chemical and biosensors;
- Digital, frequency, period, duty-cycle, time interval, PWM, pulse number output sensors and transducers;
- Theory, principles, effects, design, standardization and modeling;
- Smart sensors and systems;
- Sensor instrumentation;
- Virtual instruments;
- Sensors interfaces, buses and networks;
- Signal processing;
- Frequency (period, duty-cycle)-to-digital converters, ADC;
- Technologies and materials;
- Nanosensors;
- Microsystems;
- Applications.

Submission of papers

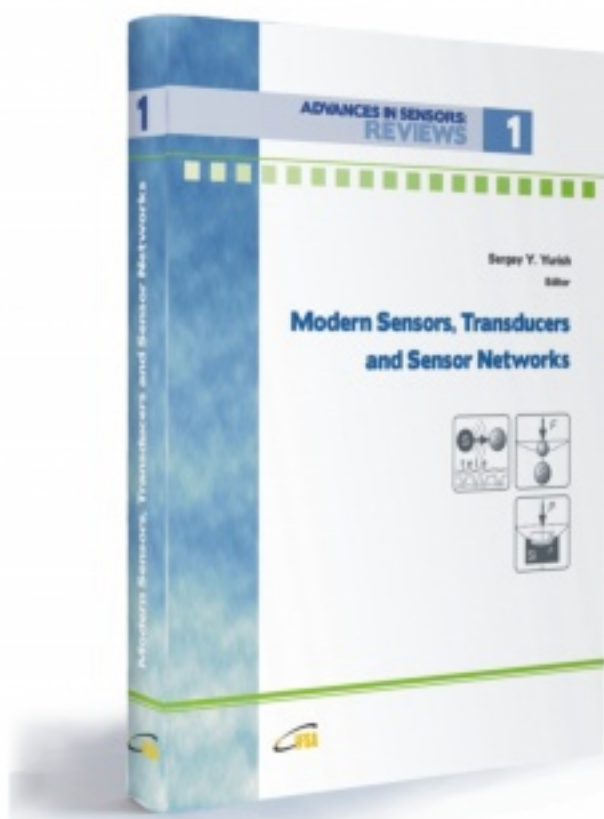
Articles should be written in English. Authors are invited to submit by e-mail editor@sensorsportal.com 8-14 pages article (including abstract, illustrations (color or grayscale), photos and references) in both: MS Word (doc) and Acrobat (pdf) formats. Detailed preparation instructions, paper example and template of manuscript are available from the journal's webpage: <http://www.sensorsportal.com/HTML/DIGEST/Submission.htm> Authors must follow the instructions strictly when submitting their manuscripts.

Advertising Information

Advertising orders and enquires may be sent to sales@sensorsportal.com Please download also our media kit: http://www.sensorsportal.com/DOWNLOADS/Media_Kit_2012.pdf

Sergey Y. Yurish
Editor

Modern Sensors, Transducers and Sensor Networks



Modern Sensors, Transducers and Sensor Networks is the first book from the Advances in Sensors: Reviews book Series contains dozen collected sensor related state-of-the-art reviews written by 31 internationally recognized experts from academia and industry.

Built upon the series Advances in Sensors: Reviews - a premier sensor review source, the *Modern Sensors, Transducers and Sensor Networks* presents an overview of highlights in the field. Coverage includes current developments in sensing nanomaterials, technologies, MEMS sensor design, synthesis, modeling and applications of sensors, transducers and wireless sensor networks, signal detection and advanced signal processing, as well as new sensing principles and methods of measurements.

Modern Sensors, Transducers and Sensor Networks is intended for anyone who wants to cover a comprehensive range of topics in the field of sensors paradigms and developments. It provides guidance for technology solution developers from academia, research institutions, and industry, providing them with a broader perspective of sensor science and industry.

Order online:

http://sensorsportal.com/HTML/BOOKSTORE/Advance_in_Sensors.htm



www.sensorsportal.com