Abstract Book

IESCMP2023

International Experts Summit on

Condensed Matter Physics and Materials

OCTOBER 12, 2023

Contact Us
Hyderabad, Telangana-500083
INDIA
Phone: +91-8886220590
Email: contact@meghazmeetings.com

About IESCMP 2023

We are pleased to invite all researchers, young scholars, delegates, experts and students from all over the world to attend the International Experts Summit on Condensed Matter physics and Materials (IESCMP2023) will be held in Dubai, UAE during October 12-14, 2023.

IESCMP2023 provides a platform of international standards where you can discuss and share knowledge on Condensed Matter Physics and Materials to bring a unique forum for exchanging the information regarding the latest developments, finding solutions and enriching the knowledge. In addition to Presentations, Workshops, and Discussions, the conference also offers a unique venue for renewing professional relationships, and providing plenty of networking opportunities during the summit.

We're looking forward to Meghaz meetings with researchers from different countries around the globe for sharing innovative and great results in Condensed Matter physics and Materials.

Committees

H. M. Srivastava	*University of Victoria, Canada*
Mohamed A. Swillam	*American University in Cairo, Egypt*
Yau Hon Keung	*City University of Hong Kong, Hong Kong*
Ali Hussain Mohammed	*KL University, India*
A. F. M. Anwar	*university of connecticut, USA*
Sumit Kumar Gupta	*Parishkar College Of Global Excellence, India*
Stoycho D Stoev	*Trakia University, Bulgaria*
Bachir Raho	*Mascara University, Algeria*
Sechene Stanley Gololo	*Sefako Makgatho Health Sciences University, South Africa*

Lattice Reactions and Structural Changes Governing Reversibility in Shape Memory Alloys

Osman Adiguzel
Firat University, Department of Physics, Elazig, Turkey

Shape memory alloys take place in a class of adaptive structural materials called intelligent or smart materials by giving stimulus response to changes in the external conditions. These alloys exhibit dual characteristics, shape memory effect and superelasticity with the recoverability of two shapes at different conditions. These alloys are functional materials with these properties and used as shape memory elements in many interdisciplinary fields. Shape memory effect is initiated thermomechanical treatments by cooling and deformation and performed thermally on heating and cooling. Therefore, this behavior can be called Thermoelasticity. Deformation in low temperature condition is plastic deformation, with which strain energy is stored in the materials and released on heating by recovering the original shape. This phenomenon is governed by lattice reactions, thermal and stress induced martensitic transformations, with which crystal structures of materials change. Thermal induced martensitic transformation occurs on cooling with cooperative movement of atoms in <110 > -type directions on {110} - type planes of austenite matrix, along with lattice twinning and ordered parent phase structures turn into the twinned martensite structures. Twinned structures turn into detwinned martensite structures by means of stress induced martensitic transformations with deformation. Detwinned martensite structures turn into the ordered parent phase structures, by means reverse austenitic transformation on heating after these treatments. Superelasticity is performed in only mechanical manner by stressing and releasing the materials in elasticity limit in the parent austenite phase region, and shape recovery occurs instantly upon releasing, by exhibiting elastic materials behavior. Superelasticity is also result of stress induced martensitic transformation, and the ordered parent phase structures turn into the detwinned martensite structures by stressing. Superelasticity is performed in non-linear way, unlike normal elastic materials behavior, loading and releasing paths are different, and cycling loop refers to the energy dissipation.

Copper based alloys exhibit this property in metastable β-phase region. Lattice twinning is not uniform in these alloys and give rise to the formation of layered structures, like 3R, 9R or 18R depending on the stacking sequences on on {110} - type planes of austenite matrix.

In the present contribution, x-ray diffraction and transmission electron microscopy (TEM) studies were carried out on copper based CuZnAl and CuAlMn alloys. X-ray diffraction profiles and electron diffraction patterns reveal that both alloys exhibit super lattice reflections inherited from parent phase due to the displacive character of martensitic transformation.

Keywords
Shape memory effect, martensitic transformation, thermoelasticity, superelasticity, twinning, detwinning.

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied were focused on shape memory effect in shape memory alloys. His academic life started following graduation by attending an assistant to Dicle University in January 1975. He became professor in 1996 at Firat University in Turkey, and retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He supervised 5 PhD- theses and 3 M. Sc- theses and published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international level with contribution. He served the program chair or conference chair/co-chair in some of these activities. Also, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Additionally, he joined over 120 online conferences in the same way in pandemic period of 2020-2022.

Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

Determination of charge centroid location and energy depth of charge carriers trapped in silicon nitride charge-trap layers

K. Kobayashi*
Tokai University, 4-1-1 Kitakaname, Hiratsuka, Kanagawa 259-1292, Japan

Abstract
In recent NAND-type flash memories, electrons and holes are injected from the silicon body into the silicon nitride layer under high gate voltages and are trapped by point defects existing in the layer. These phenomena are applied to programming and erasing operations for data storage. In order to understand the electron and hole trapping phenomena in the silicon nitride layer, two methods combining electrical measurements and analysis have been developed, and the charge centroid locations and the densities of trapped electrons and holes have been determined [1,2]. In addition, two analytical methods have been proposed to estimate the energy depths of trapped electrons and holes [3,4]. This presentation summarizes the research results of charge centroid locations, densities and energy depths of electrons and holes trapped in the silicon nitride layer.

Keywords
Silicon Nitride; Trap States; Flash Memory; Charge Centroid; MONOS-Type Memory

References
1. S. R. A. Ahmed, K. Kato, and K. Kobayashi, Materials Science in Semiconductor Processing, 70, 265-271 (2017).
2. K. Kobayashi, H. Mino, Eur. Phys. J. Appl. Phys., 91, 10101 (2020).
3. S. R. A. Ahmed, K. Kobayashi, IEICE Trans. Electron., E100-C, 662-668 (2017).
4. K. Kobayashi, S. Nakagawa, 2021 IEEE 16th Nanotechnology Materials and Devices Conference (NMDC), pp. 155-159, 2021.

Biography
Kiyoteru Kobayashi received the Doctor of Engineering from Nagoya University, Japan. He joined Mitsubishi Electric Corporation in 1983 and Renesas Technology Corporation in 2003. He was engaged research and development on nonvolatile semiconductor memory (NVM) and thin film formation technologies for applications in semiconductor integrated circuits. He also studied dielectric breakdown and charge trapping phenomena in SiO2 and Si3N4 thin films. In 2005, he joined Tokai University, Japan, as a Full-time Professor, School of Engineering. His current research activities include the experimental characterization and modeling of charge trapping phenomena in dielectric thin films for NVM applications. He is the author and co-author of approximately 100 articles in journals and conferences as well as the author of a textbook on semiconductor device engineering for integrated circuits. He has served as chairperson or organizer of academic conferences and symposia in the fields of semiconductor integrated circuits technology and thin film technology.

Electromagnetic Field Modulations in Ceramic Photonic Crystals Fabricated by Stereolithographic Additive Manufacturing

Soshu Kirihara
Joining and Welding Research Institute, Osaka University, Japan.

Abstract
In stereolithographic additive manufacturing (STL-AM), 2-D cross sections were created through photo polymerization by UV laser drawing on spread resin paste including nanoparticles, and 3-D models were sterically printed by layer lamination. The lithography system has been developed to obtain bulky ceramic components with functional geometries. An automatic collimeter was newly equipped with the laser scanner to adjust the beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As the row material of the 3-D printing, nanometer sized metal and ceramic particles were dispersed into acrylic liquid resins at about 60 % in volume fraction. These materials were mixed and deformed to obtain thixotropic slurry. The resin paste was spread on a glass substrate with 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted to 50 μm in variable diameter and scanned on the spread resin surface. Irradiation power was automatically changed for an adequate solidification depth for layer bonding. The composite precursors including nanoparticles were dewaxed and sintered in the air atmosphere. In recent investigations, ultraviolet laser lithographic additive manufacturing (UVL-AM) was newly developed as a direct forming process of fine metal or ceramic components. As an additive manufacturing technique, 2-D cross sections were created through dewaxing and sintering by UV laser drawing, and 3-D components were sterically printed by layer laminations with interlayer joining. Through computer-aided smart manufacturing, design, and evaluation (Smart MADE), practical material components were fabricated to modulate energy and material transfers in potential fields between human societies and natural environments as active contributions to Sustainable Development Goals (SDGs).

Biography
Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics as Sustainable Geoengineering” for environmental modifications and resource circulations, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

Changes in the Coercivity Fields of Magnetoresistance Hysteresis Loops Under the Influence of a Spin-Polarized Current

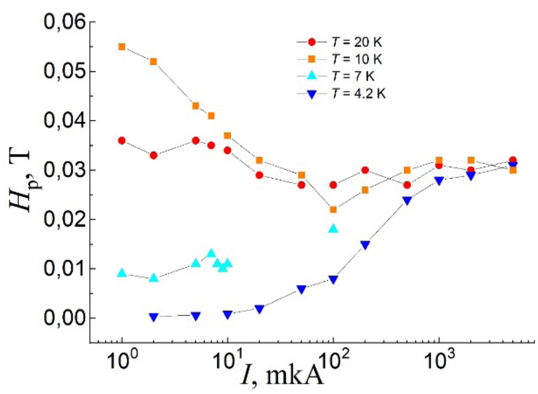
E. Beliayev*[1], I. Mirzoiev[1], V. Andrievskii[1], A. Terekhov[1], Yu. Kolesnichenko[1], V. Horielyi[1], I. Chichibaba[2]

[1]B. Verkin Institute for Low Temperature Physics and Engineering (Kharkiv) @ Nat. Acad. of Sci. of Ukraine 2 National Technical University «Kharkiv Polytechnic Institute», Kharkiv, Ukraine.

Abstract

Studying the influence of measuring current (I), flowing through pressed samples of CrO2 nanoparticles (ø ≈ 120 nm., coated with thin d ≈ 3 nm. dielectric shells of β-CrOOH) on the characteristic fields of magnetoresistance hysteresis loops (Hp), we found that despite the initial decrease caused by overheating effects (at T = 10 K), with further decrease in temperature, the coercivity of magneto-resistance hysteresis associated with magnetic coercivity of percolation current chains [1], formed in a powder sample with lowering temperature, begins to grow with growing current (T = 4.2 and 7 K).

We explain this low-temperature increase in coercivity Hp by the growing influence of CrO2 spin polarization. Powerful spin-polarized measuring current (up to 5 mA) flowing through critical links of the percolation cluster, which are usually large multi-domain CrO2 particles, is capable of displacement of domain boundaries up to the transformation of a multi-domain particle into a single-domain one [2]. Displacement of domain boundaries relative to their equilibrium position under the influence of a spin-polarized current reduces the response of the system to an external magnetic field, which corresponds to an increase in the coercivity fields of magnetoresistance hysteresis loops.



Keywords

Spin-Polarized Current; Chromium Dioxide; Magnetoresistance; Coercivity

References

1.E. Beliayev, V. Horielyi, Yu. Kolesnichenko, Low Temp. Phys. 47(5), 355 – 377 (2021);
2.A. Brataas, A. D. Kent, H. Ohno, Nat. Mater., 11(5), 372–381 (2012).

Biography

Eugene Beliayev, born in 1962. Ph.D. 2002 «Effects of Microscopic and Macroscopic Disorder and Metal-Insulator Transition in Conductivity of Thin Au Films». Senior Researcher Certificate – 2018. Scientific Group Leader: "Electronic, Magnetic and Superconducting Properties of Disordered Metals and Compounds" at the Dept. of "Point Contact Spectroscopy". Dr. of Sci. Dissertation "Influence of Structural and Phase Inhomogeneities on Electron Localization and Insulator-Metal and Metal-Superconductor Transition". For 37 years, I have been working at B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine (B. Verkin ILTPE NAS of Ukraine, Kharkiv). From 01/06/2022, fleeing the Ukrainian war, my family and I went to Turkey, where I am now writing articles on my previous experimental research, waiting for the end of hostilities.

Magnetization of magnetically inhomogeneous Sr2FeMoO6-δ nanoparticles

Gunnar Suchaneck

Institute of Solid-State Electronics, TU Dresden, Dresden, Germany, email:

Abstract

Magnetization is a key property of magnetic materials. Nevertheless, a satisfactory, analytical description of the temperature dependence of magnetization in double perovskites such as strontium ferromolybdate (SFMO, Sr2FeMoO6-δ) is still missing. In this work, we develop, for the very first time, a model of the magnetization of nanosized, magnetically SFMO inhomogeneous nanoparticles. The temperature dependence of magnetization was approximated by an equation consisting of a Bloch-law spin wave term, a higher order spin wave correction, both taking into account the temperature dependence of the spin-wave stiffness, and a superparamagnetic term including the Langevin function. In the limit of pure ferromagnetic behavior, the model is applicable also to SFMO ceramics. At higher temperatures (> 200 K), the magnetization change is overestimated since the appearance of magnetic disorder in SFMO induces a pronounced extrinsic damping of spin waves. In the vicinity of the Curie temperature (T/TC > 0.85), the model fails. The model provides a base for the design of spintronic devices, magnetic sensors as well as for medical application of magnetic particles, e.g., contrast agents in clinical MRI magnetic resonance imaging or local heating using strong magnetic AC-fields (hyperthermia).

Biography

Dr. Gunnar Suchaneck was Senior Researcher and Chief Assistant of the Solid-State Electronics Laboratory at TU Dresden. He received his Ph.D. in physico-mathematical sciences from the Electrotechnical University - LETI, St. Petersburg, Russia, in 1983. Dr. Suchaneck has been retired since March 2021 but continues to work on a part-time basis. His current research interests include solid state sensor technology: thin film materials, characterization of thin films by optical and electrical measurements. He has coauthored more than 280 technical publications in books, scientific journals, and conference proceedings, and has coauthored 15 patents.

Thermodynamics and Phase Transitions of the Classical Spin-1 Ising Model for Magnetic Systems

R. Zivieri[1], *
1Istituto Nazionale di Alta Matematica (INdAM), Rome (Italy)

Abstract
The critical properties of the classical spin-1 Ising Hamiltonian applied to magnetic systems characterized by the first-neighbors biquadratic exchange, the anisotropy and the external magnetic field contributions are theoretically investigated. The first-neighbors bilinear exchange interaction is set equal to zero. To determine the critical behavior, the spin-1 Ising Hamiltonian is mapped onto the spin-1/2 Ising Hamiltonian by using the Griffith's variable transformation [1]. The critical surface of a 2D square magnetic lattice is determined in the parameter space as a function of the magnetic parameters and the phase transition occurring across it is quantitatively discussed by calculating, for each spin, the free energy and the magnetization. The free energy of the 2D square magnetic lattice, described via the three-state spin-1 Ising model, is obtained from an empirical expression of the partition function of a spin-1/2 Ising model in an external magnetic field and applied to a 2D magnetic lattice [2]. These results could pave the way to numerical simulations and to measurements able to confirm the analytical predictions for magnetic materials.

Keywords
Ising Model; Griffith's Transformation; Partition Function; Parameter Space; 2D Magnetic Lattice

References
1. R.B. Griffiths, Physica, 33, 689-690, (1967).
2. R.Q. Wei, arXiv:1905.04295v2.

Biography
Roberto Zivieri is a theoretical condensed matter physicist. He got the Master Degree in Medicine and Surgery and in Physics with honors, and the PhD in Physics with grade excellent from the University of Modena, Italy. He is author of about 150 scientific contributions in international and reputed journals. He has been serving as an editorial board of repute. He is member by invitation of the American Physical Society (APS), American Chemical Society (ACS) and member after regular competition of the Italian Society of Mathematical Physics, Italian Society of Physics (SIF) and Italian Society of Magnetism. He is winner of the APS Award "Outstanding Referees 2016" equivalent to an APS journals fellowship and of the Albert Nelson Lifetime Achievement Award.

Enhancement of Thermal Conductivity and Heat Transfer rate involving Hybrid Nano fluids on MHD Stagnation Point Flow over a Stretching Sheet

Dr. Santoshi Misra

Dean, Student Affairs, Assistant Professor, Department of Mathematics, St. Ann's College for Women Mehdipatnam, Hyderabad, Telangana State, India.

Abstract

Nano fluids play a vital role in the world of industry and technology. With several market needs the research and advancement in Nano fluids and their applications has become significantly predominant. Nano fluids are Nano-metre sized particles suspended in base fluids like water, ethylene, glycol, oil etc., to enhance the thermal conductivity and heat transfer rate of energy transmission fluids in an economical way being cost effective. Hybrid Nano Fluids are a high end version having varied thermal applications and useful in industrial appliances working with high temperatures and are developed by diffusing two distinct forms of Nano particles in the base fluid. The research focuses on studying the behaviour of Hybrid Nano Fluid and its impact on the MHD Stagnation point flow over a stretching sheet. The highly non-linear governing equations of the fluid are transformed into ordinary differential equations using similarity transformations and reduced to first order for producing solvable equations. The 4th order RK method has been systematically employed for the further segregation to obtain accurate results equipped with shooting technique numerically. The effect of various dimensionless parameters like the Skin Friction, Nusselt number, Prandtl number, Eckert number, Lewis number, Biot number, Magnetic parameter, Thermophoresis parameter, Brownian motion on the Velocity, Temperature and Concentration profiles of the fluid flow are recoded and are in good agreement with the references used based on the results obtained from the graphs and tables in our research consistently showcasing the influences clearly.

Keywords

Hybrid Nano Fluid; Brownian Motion; Thermophoresis; Velocity; Temperature; Concentration; Stretching Sheet; Stagnation Point Flow

Theoretical Study on In-Plane, Out-of-Plane, and Transverse Anisotropic Magnetoresistance Effects for Ferromagnetic Films

S. Kokado[1]* and M. Tsunoda[2]
1 Faculty of Engineering, Shizuoka University, Hamamatsu, Japan.
2 Graduate School of Engineering, Tohoku University, Sendai, Japan.

Abstract
The anisotropic magnetoresistance (AMR) effect, in which the electrical resistivity depends on the direction of magnetization M, has been observed for a variety of ferromagnets such as Fe, Co, Ni, Fe4N, and half metals. The AMR effect has often been explained by using the electron scattering theory based on an extrinsic mechanism [1], in which the conduction (s) electron is scattered into the localized d states by nonmagnetic impurities.
The AMR effect has recently been investigated for various directions of M. The AMR effects are, for example, in-plane AMR (IAMR), out-of-plane AMR (OAMR), and transverse AMR (TAMR) effects for ferromagnetic films. When the current flows in the [100] direction, the IAMR, OAMR, and TAMR mean that M lies in the (001), (010), and (100) planes, respectively. Quite recently, the IAMR, OAMR, and TAMR effects have been studied for CoxFe1-x films by using the first principles transport calculation with an intrinsic mechanism [2], in which the energy band structure depends on the direction of M. The calculation results have been verified experimentally.
On the other hand, the IAMR [3], OAMR, and TAMR effects have been experimentally measured also for Fe4N films. Here, the IAMR and OAMR exhibit the negative AMR with the twofold symmetry, whereas the TAMR shows the positive AMR with the fourfold symmetry. Such experimental results, however, have scarcely been analyzed theoretically. Our concern is therefore whether the experimental results also can be explained by using the electron scattering theory [1].
In this study, we analyze the experimental results of IAMR, OAMR, and TAMR for Fe4N films using the electron scattering theory with the extrinsic mechanism. The theory is based on the two-current model with the s-s and s-d scatterings due to the impurities, where d is the localized d states with the spin-orbit interaction, exchange splitting energy, and crystal field energy. We find that the calculation results of IAMR, OAMR, and TAMR agree qualitatively well with the respective experimental results. In addition, the feature of each AMR is considered on the basis of the probability density of the d states of the current direction.

Keywords
Anisotropic Magnetoresistance Effect; Spin-Orbit Interaction; Crystal Filed; Theory

References
1. S. Kokado et al., J. Phys. Soc. Jpn. 81, 024705 (2012); ibid. 91, 044701 (2022).
2. F. L. Zeng et al., Phys. Rev. Lett. 125, 097201 (2020).
3. M. Tsunoda et al., Appl. Phys. Express 3, 113003 (2010).

Biography
Satoshi Kokado received his Ph. D degree in condensed matter theory from Graduate School of Engineering Science, Osaka University, Japan in 1999. He was a researcher at Central Research Laboratory, Hitachi Limited and a postdoctoral fellow at National Institute of Advanced Industrial Science and Technology. He is now a Professor of Shizuoka University, Japan. His research interests are spin-dependent transport, spin-atomic vibration interaction, magnetic phase transition, magnetic resonance, and magnetic excitation. In 2005, he received an outstanding oral presentation award for his presentation entitled "Theoretical Analysis of Spin-Polarized Transport in Iron Nitride Fe4N" from Magnetics Society of Japan. In 2017, he received the excellent reviewers award in KAKENHI from Japan Society for the Promotion of Science. In 2020, he received the 25th outstanding paper award for his paper entitled "Anisotropic Magnetoresistance Effects in Fe, Co, Ni, Fe4N, and Half-Metallic Ferromagnet: A Systematic Analysis" from the Physical Society of Japan.

Photonic Glass and Fiber for Detection Applications

S. Zhou *

[1]School of Materials Science and Engineering, South China University of Technology, China.

Abstract

Multicomponent glasses and fibers are considered to be the fundamental building blocks of the next-generation photonics. In this talk, the recent progress in designs, fabrications and applications of selected materials for multicomponent optical glasses and fibers is introduced. The results about the relation between the glass microstructure and its optical properties are introduced. The glasses and fibers with various detection functions, including high-energy radiation, neural electrical signal and ultra-short optical pulse are highlighted.

Keywords

Glass Fiber; Photonics; Detection

References

1. G. Du, S. Wen, J. Zhao, P. Ran, D. Wang, L. Wei, X. Qiao, Y. Yang, J. Qiu, S. Zhou, Adv. Mater. 35, 2205578 (2023).
2. M. Du, J. Wang, S. Xu, H. Li, Z. Zhang, Y. Qi, S. Lv, J. Qiu, Y. Yan, S. Zhou, Adv. Fiber Mater. 5, 1493-1504 (2023).
3. Z. Lin, S. Lv, Z. Yang, J. Qiu and S. Zhou, Adv. Sci. 9, 2102439 (2022).
4. J. Tang, S. Lv, Z. Lin, G. Du, M. Tang, X. Feng, J. Guo, X. Li, J. Chen, L. Wei, J. Qiu and S. Zhou, J. Mater. Sci. & Technol. 129, 173-180 (2022).
5. X. Feng, Y. Lun, X. Jiang, J. Qiu, H. Yu and S. Zhou, Adv. Mater. 33, 2006482 (2021).
6. M. Du, L. Huang, J. Zheng, Y. Xi, Y. Dai, W. Zhang, W. Yan, G. Tao, J. Qiu, K. So, C. Ren and S. Zhou, Adv. Sci. 7, 2001410 (2020).

Biography

Dr. Shifeng Zhou is Professor of Materials Science and Engineering at South China University of Technology. His primary research area is photonic glass and fiber. He has published over 150 papers in peer-reviewed journals. He is the recipient of the Gottardi Award of the International Commission on Glass and the Motoharu Kurata Award of the Ceramic Society of Japan. He is the committee member of the TC07: Crystallization & GCs (International Commission on Glass), the Deputy Editor of Chin. Opt. Lett. and the Associate Editor of J. Am. Ceram. Soc. and J. Ceram. Soc. Japan.

Quantized Topological Chagers of Ferroelectric Skyrmions Formed in Two-Dimensional Multiferroic Materials

Zhaosen Liu,
College of Physics and Electronic Engineering, Hengyang Normal University, China

Abstract
In multiferroic materials, microscopic magnetic and electric textures are coupled through magnetoelectric (ME) interaction. Thus, a ferroelectric (FE) skyrmionic crystal (or lattice so as to be abbreviated as SkL) is expected to be induced once one ferromagnetic (FM) SkL is stabilized. Based on the p-d hybridization theory, we carry out simulations by means of a quantum computational method. Consequently, we observe that the two sorts of topological crystals can indeed be generated simultaneously in a two-dimensional multiferroic monolayer; each FE skyrmion is a ferroelectric dipolar complex formed around one FM skyrmion; the topological charges of these FE skyrmions are quantized to be integers, half integers and multiples of certain fractional values; and a perpendicularly applied electric field is able to alter the wavelengths of the FM and FE SkLs, elevate their formation temperatures, and destroy them below the original critical temperatures.

References
1. Liu Z.-S. Phys. E 144 (2022) 115406.
2. Liu Z.-S., et al., J. Phys.: Condens. Matte 23 (2011) 016002.
3. Liu Z.-S., H. Ian, J. Phys.: Condens. Matter. 31 (2019) 29.
4. Liu Z.-S., M. dos S. Dias, S. Lounis, J. Phys.: Condens. Matter. 32 (2020) 425801.
5. Liu Z.-S., H. Ian, Y.W. Liu, J. Magn. Magn. Mater. 561 (2022) 169515.
6. Seki S., S. Ishiwata, Y.Tokura, Phys. Rev. B 86 (2012) 060403 (R) . [7] Liu Y.H., Y.Q. Li, and J. H. Han, Phys. Rev. B 87 (2013) 100404.

Biography
1978.3 1981.12: A student of Jiangsu Normal University, specialized in physics, earned B.S. degree. 1982.1 1984.8: A teaching assistant of the Physics Department of the above university. 1984.9 1988.4: A graduate student of Acoustics Institute, Chinese Academy, obtained M.S. degree. 1988.6 1992.8: A lecturer of China University of Mining Technology. 1992.9 1996.4: A postgraduate student of Helsinki University of Technology (HUT), Finland. obtained licentiate degree. 1996.5 1999.7: Studied at TU Dresden, Germany, obtained Ph.D degree in physics. 2003. 3 : A teacher and researcher at Nanjing University of Information Science and Technology, obtained a full professorship in 2004. 2015.4 --: Visiting research fellow at University of Macau.