

CERN-INTC-2017-020 (INTC-P-502)

Local Probing of Ferroic and Multiferroic Compounds Collaboration

Deliverables (2012-2016)

Within the new proposal concept, the collaboration is composed by groups from universities already collaborating in the field of material's science for many years. Some of these groups are well experienced with ISOLDE and nuclear radioactive methods for many years, while for some others this is a new concept of work. By this reason two kinds of deliverables are considered:

- 1) Deliverables related with the use of nuclear radioactive techniques at ISOLDE under the concept of IS487 (Study of Local Correlations of Magnetic and Multiferroic Compounds), covering training (thesis), publications and conference participations.
- 2) Deliverables related with the different groups and dynamics regarding research on related materials with non-radioactive methods. The fundamental ground of knowledge of the different groups and institutes is solid state physics and materials science research; therefore, only selected publications are included for the 2012-2016 period.

1) Deliverables with radioactive nuclear methods - IS487

a. Thesis

1. Ph. D. in Physics – Advanced nanoscopic studies in magneto-electric manganites and high TC superconductors, Tania Manuela de Melo Mendonça, Faculdade de Ciências da Universidade do Porto; concluded in 2012.
2. Ph. D. in Physics – Local probing spinel and perovskite complex magnetic systems Gonçalo Pinho Oliveira, Faculdade de Ciencias da Universidade do Porto; concluded, defense at the 17th February 2017
3. Ph. D. in Physics – Experimental and Modeling studies of Magnetoelectric Multiferroic Heterostructures, Carlos de Oliveira Amorim, October 2014.
4. Ph. D. in Physics – Innovative Nanogenerators for Thermal Energy Harvesting: From Material Design Towards Microdevices, Ana Lucia Mota Pires, October 2015.
5. Ph. D. in Physics – Functional lattice instabilities in naturally layered perovskites: from local probe studies to macroscopic cross-coupling effects Pedro Rocha Rodrigues, October 2016.
6. MSc in Physics - Local probe studies of the Jahn-Teller transition, Ricardo César Carvalho Teixeira, defense in March 2017.

b. Publications

1. Hyperfine local probe study of alkaline-earth manganites SrMnO₃ and BaMnO₃, J.N. Gonçalves, V.S. Amaral, J.G. Correia, A.M.L. Lopes, J.P. Araújo, P.B. Tavares, Journal of Physics: Condensed Matter 26, 215401 (2014).
doi:<http://dx.doi.org/10.1088/0953-8984/26/21/215401>
2. Local symmetry lowering in CdMn₂O₄ spinel, G.N.P. Oliveira, R. Teixeira, T.M. Mendonça, M.R. Silva, J.G. Correia, A.M.L. Lopes, and J.P. Araújo, J. Appl. Phys. 116, 223907 (2014).
doi:<http://dx.doi.org/10.1063/1.4903949>
3. Nanostructures and thin films of transparent conductive oxides studied by perturbed angular correlations, M.B. Barbosa, J.N. Gonçalves, A. Redondo-Cubero, S.M.C. Miranda, R. Simon, P. Kessler, M. Brandt, F. Henneberger, E. Nogales, B. Méndez, K. Johnston, E. Alves, R. Vianden, J.P. Araújo, K. Lorenz, J.G. Correia, physica status solidi (b) 250 (4), 801-808 (2013).
doi:<http://dx.doi.org/10.1002/pssb.201200923>
4. Local probe studies in the weakly Jahn-Teller distorted LaMnO_{3.08} manganite, A.M.L Lopes, VS Amaral, JG Correia and JP Araújo, Physica status solidi (b) 251, 565 (2013)
doi:<http://dx.doi.org/10.1002/pssb.201350075>
5. Jahn-Teller distortion relaxation across the LaMnO₃+D phase diagram, A.M.L Lopes, V.S. Amaral, J.G. Correia and J.P. Araújo, Journal of Physics: Condensed Matter 25 385602 (2013).
doi:<http://dx.doi.org/10.1088/0953-8984/25/38/385602>
6. Ab initio study of the relation between electric polarization and electric field gradients in ferroelectrics, J.N. Gonçalves, A. Stroppa, J.G. Correia, T. Butz, S. Picozzi, A.S. Fenta, V.S. Amaral, Physical Review B 86 (3), 035145 (2012).
doi:<http://dx.doi.org/10.1103/PhysRevB.86.035145>

7. Dynamic off-centering of Cr³⁺ ions and short-range magneto-electric clusters in CdCr₂S₄, G.N.P. Oliveira, A.M. Pereira, A.M.L. Lopes, J.S. Amaral, A.M. dos Santos, Y. Ren, T.M. Mendonça, C.T. Sousa, V.S. Amaral, J.G. Correia, and J.P. Araújo, Physical Review B 86, 224418 (2012).
doi:<http://dx.doi.org/10.1103/PhysRevB.86.224418>
 8. Characterization of nanostructured HfO₂ using RBS and PAC
F.H.M. Cavalcante, M.R. Gomes, A.W. Carbonari, L.F.D. Pereira, D.A. Rossetto, M.S. Costa, E. Alves, N.P. Barradas, N. Franco, L.M. Redondo, A.M.L. Lopes, J.C. Soares, Nuclear Instruments and Methods in Physics Research B 273, 195 (2012).
doi:<http://dx.doi.org/10.1016/j.nimb.2011.07.074>
- c. Publications Submitted or being prepared
1. Pressure effects on spin-lattice coupling of CdCr₂S₄, G. N. P. Oliveira, A. M. dos Santos, Zheng Gai, G. Halder, J. P. Araújo, A. M. L. Lopes, A. M. Pereira, Submitted to Journal of Alloys and Compounds
 2. Effect of Chemical Pressure on the magnetocaloric effect of perovskites RCrO₃ (R=Yb, Er, Sm and Y), G. N. P. Oliveira, A. Pires, P. Machado, L. Fernandes, P. B. Tavares, A. M. Pereira, J. P. Araújo, and A. M. L. Lopes
 3. Local distortions in multiferroic SmCrO₃, G. N. P. Oliveira, R. Teixeira, J. G. Correia, J. P. Araújo, and A. M. L. Lopes
- d. Proceedings
1. Local probing of multiferroics: First-principles study of hyperfine parameters in YMnO₃ and YMn₂O₅, J.N. Gonçalves, V.S. Amaral, J.G. Correia, A. Stroppa, A.S. Fenta, A. Baghizadeh, S. Picozzi, EPJ Web of Conferences 75, 09002 (2014).
doi:<http://dx.doi.org/10.1051/epjconf/20147509002>
 2. Synchrotron radiation experiments on multiferroic, magnetocaloric and magnetic nanostructured materials, M.P. Fernández-García, J. Agostinho Moreira, A.M. Pereira, J. B. Sousa, J.P. Araújo, Ciência e Tecnologia dos Materiais, 24, 3/4 (2012).
- e. Oral Communications in international meetings
1. Study of orbital melting and Jahn-Teller distortions in La(Nd, Sm, Pr)MnO₃ Manganites by means of perturbed angular correlations, R. Teixeira, G.N.P. Oliveira, M. B. Barbosa, J. N. Gonçalves, J. Schell, T. M. Mendonça, J.G. Correia, A.M.L. Lopes and J. P. Araujo, International Conference on Hyperfine Interactions and their Applications, Leuven Belgium, July 2016.
 2. Probing the local structure in Multiferroic SmCrO₃, G.N.P. Oliveira, R. Teixeira, J.G. Correia, J.P. Araújo, A.M.L. Lopes, ISOLDE Workshop and Users meeting, CERN, Geneva, December 2016.
 3. Study of spin-lattice competition unveiled through hydrostatic pressure in CdCr₂S₄, G. N. P. Oliveira, A.M. dos Santos, Z. Gai, J.P. Araújo, A.M.L. Lopes and A.M. Pereira, ICM2015-20th International Conference on Magnetism, Barcelona, Spain, 5-10 July, 2015.
 4. Study of spin-lattice competition through hydrostatic pressure in CdCr₂S₄, G. N. P. Oliveira, A.M. dos Santos, Z. Gai, J.P. Araújo, A.M.L. Lopes and A.M. Pereira, EMF2015 - 13th European Meeting on Ferroelectricity, Porto, Portugal, 28 June to 3 July, 2015.

5. Study of orbital melting and Jahn-Teller distortions in La(Nd, Sm, Pr)MnO₃ Manganites by means of perturbed angular correlations, R. Teixeira, G.N.P. Oliveira, M. B. Barbosa, J. N. Gonçalves, J. Schell, T. M. Mendonça, J.G. Correia, A.M.L. Lopes and J. P. Araujo, ISOLDE Workshop and Users meeting, CERN Switzerland, December 2015.
6. Jahn-Teller distortions study in Sm(Nd)MnO₃ Manganites, R. Teixeira, A.M.L. Lopes, J.M.Ramos, T.M. Mendonça, G.N.P. Oliveira, M. B. Barbosa, A.S. Fenta, R.Vianden and J.G. Correia, Isolde Workshop and Users meeting, CERN, Switzerland, December 2014
7. Perturbed Angular Correlation Studies in Complex Magnetic Oxides, A.M.L. Lopes, ISOLDE CERN 2014, October 2014.
8. Perturbed Angular Correlation studies in complex magnetic oxides, A.M.L. Lopes Invited seminar, Oak Ridge National Laboratory ORNL, July 2014.
9. Dynamic off-centering of Cr³⁺ ions and short-range magneto-electric clusters in CdCr₂S₄, G.N.P. Oliveira, A.M. Pereira, A.M.L. Lopes, J.S. Amaral, A.M. dos Santos, Y. Ren, T.M. Mendonça, C.T. Sousa, V.S. Amaral, J.G. Correia and J.P. Araújo, ISOLDE Workshop and Users meeting 2013, CERN, Switzerland, 25-27 November, 2013.
10. Local probing in multiferroics, J. N. Gonçalves, V. S. Amaral, J. G. Correia, A. Stroppa, A. S. Fenta, A. Baghizadeh, S. Picozzi, Joint European Magnetic Symposia (JEMS), Rhodes, Greece, 25-30 August (2013).
11. Dynamic off-centering of Cr³⁺ ions and short-range magneto-electric clusters in CdCr₂S₄, Intensive Programme on Physics and Materials Science of nanostructures probed by nuclear methods and intense particle beams, G.N.P. Oliveira, A.M. Pereira, A.M.L. Lopes, J.S. Amaral, A.M. dos Santos, T.M. Mendonça, C.T. Sousa, Y. Ren, V.S. Amaral, J.G. Correia, J.P. Araújo, IKS – Vaalbeek, Leuven, Belgium, 15-24 April, 2013

f. Oral communications in national meetings

1. Jahn-Teller distortions study in Sm(Nd)MnO₃ Manganites, R. Teixeira, A.M.L. Lopes, J.M.Ramos, T.M. Mendonça, G.N.P. Oliveira, M. B. Barbosa, A. S. Fenta and J.G. Correia, Encontro Nacional de Estudantes de Física 2015, IST, Lisboa, Portugal.
2. An interplay between spin, charge and lattice, G.N.P. Oliveira, A.M. Pereira, J.S.Amaral, A.M. Dos Santos, T.M. Mendonça, C.T. Sousa, Z. Gai, Y. Ren, V.S. amaral, J.G. Correia, J.P. Araújo and A.M. L. Lopes, Spinel CdCr₂S₄ , Papers@DFA, Departamento Física da FCUP Univ. do Porto, Porto, Portugal, 12 November, 2015.
3. G.N.P. Oliveira, R. Teixeira, T.M. Mendonça, J.G. Correia, A.M.L. Lopes, and J.P. Araújo, Local Symmetry Lowering in CdMn₂O₄ Spinel, VIII Jornadas IFIMUP-IN, Porto, Portugal, 12 September, 2014.
4. Ab-initio Modelling of Multiferroic Materials, J. N. Gonçalves, V. S. Amaral, J. G. Correia, A. S. Fenta, A. Baghizadeh, A. Stroppa, S. Picozzi, X Jornadas CICECO Meeting, Aveiro, April 2013

g. Poster communications in international meetings

1. Jahn-Teller distortions study in Sm(Nd, La)MnO₃ Manganites, R. Teixeira, G.N.P. Oliveira, M. B. Barbosa, J. N. Gonçalves, J. Schell, T. M. Mendonça, J.G. Correia, A.M.L. Lopes and J. P. Araujo, EMF - 13th European Meeting on Ferroelectricity, Porto, Portugal, 28th June to 3rd July, 2015.
2. Jahn-Teller distortions study in Sm(Nd)MnO₃ Manganites R. Teixeira, G.N.P. Oliveira, M. B. Barbosa, J. N. Gonçalves, J. Schell, T. M. Mendonça, J.G. Correia, A.M.L. Lopes and J. P. Araujo 20th International Conference on Magnetism (ICM)- Barcelona, 2015.

3. Local Probe Studies in perovskite RCrO_3 (R=Y, Yb, Er, Sm), G.N.P. Oliveira, P. Machado, R. Teixeira, A. Pires, G. Correia, J.P. Araújo, and A.M.L. Lopes, EMF2015-13th European Meeting on Ferroelectricity, Porto, Portugal, 28 June to 3 July, 2015.
4. Jahn-Teller distortions study in Manganites, R. Teixeira, G.N.P. Oliveira, M. B. Barbosa, J. N. Gonçalves, J. Schell, T. M. Mendonça, J.G. Correia, A.M.L. Lopes and J. P. Araujo, 9th Central European Training School on Neutron Techniques, 2015, Budapest, Hungria, 2015.
5. Short-range magneto-electric clusters in CdCr_2S_4 : A dynamic off-centering of Cr^{3+} magnetic ions, G.N.P. Oliveira, A.M. Pereira, J.S. Amaral, A.M. dos Santos, T.M. Mendonça, C.T. Sousa, J.A. Moreira, Y. Ren, V.S. Amaral, J.G. Correia, J.P. Araújo, A.M.L. Lopes, IEEE International Magnetics Conference, INTERMAG Europe 2014, Dresden, Germany, 4 - 8 May, 2014.
6. Electric Field Gradient and Magnetic Hyperfine Field Calculations and Measurements in Multifunctional Materials, J. N. Gonçalves, V. S. Amaral, J. G. Correia, A. S. Fenta, A. Stroppa, A. Baghizadeh, S. Picozzi, MAMA-Trend: Trends, challenges and emergent new phenomena in multi-functional materials, Sorrento, Italy, 20-23 May 2013.
7. Ab initio study of the relation between electric polarization and electric field gradients in ferroelectrics, J. N. Gonçalves, A. Stroppa, J. G. Correia, T. Butz, S. Picozzi, A. S. Fenta and V. S. Amaral, EURISOL Topical and Town Meetings, IST Lisbon – Portugal, Lisboa – Portugal, 15-19 October, 2012.
8. CdCr_2S_4 : Randomly oriented dipoles arising from Cr^{3+} dynamic off-centering
9. G.N.P. Oliveira, A.M. Pereira, A.M.L. Lopes, J.S. Amaral, A.M. dos Santos, T.M. Mendonça, C. T. Sousa, Y. Ren, V.S. Amaral, J.G. Correia, J.P. Araújo, EURISOL Topical and Town Meetings, IST Lisbon – Portugal, Lisboa – Portugal, 15-19 October, 2012.
10. CdCr_2S_4 : Magneto-electric Clusters arising from Cr^{3+} dynamic off-centering, G.N.P. Oliveira, A.M. Pereira, A.M.L. Lopes, J.S. Amaral, A.M. dos Santos, T.M. Mendonça, C.T. Sousa, Y. Ren, V.S. Amaral, J.G. Correia, J.P. Araújo, JEMS2012-Joint European Magnetic Symposia, Parma – Italy, 9-14 September, 2012.
11. Ab initio calculation and study of hyperfine properties of layered ferroelectrics doped with magnetic ions and multiferroics, A.S. Fenta, J. N. Gonçalves, V. S. Amaral, J. G. Correia, A. Stroppa, S. Picozzi, ISAF ECAPD PFM, Aveiro, Portugal, 9-13 July 2012.
12. ab- initio computation of electric field gradients and magnetic hyperfine fields as local property probes in multiferroics, J. N. Gonçalves, A. S. Fenta, A. Stroppa, J. G. Correia, S. Picozzi and V. S. Amaral, Computational Oxide Spintronics, Cheshire, United Kingdom, 5-10 May, 2012.
13. Ab initio calculation and study of hyperfine properties of layered ferroelectrics doped with magnetic ions and multiferroics. A.S. Fenta, J. N. Gonçalves, V. S. Amaral, J. G. Correia, A. Stroppa, S. Picozzi, Computational Oxide Spintronics, Cheshire, United Kingdom, 5-10 May, 2012.
14. Local probing of electrostructural properties, G.N.P. Oliveira, A.M.T. Pereira, J. Amaral, A. dos Santos, T.M. Mendonça, Y. Ren, C. Benmore, J.G. Correia, A.M.L. Lopes, J.P. Araújo, Magnetoelectric chromites, ENURS2012-1st Meeting of Synchrotron Radiation Users from Portugal, Lisboa – Portugal, 16 January, 2012.

h. Poster communications in national meetings

1. Study of orbital melting and Jahn-Teller distortions in La(Nd, Sm, Pr)MnO₃ Manganites by means of perturbed angular correlations, R. Teixeira, G.N.P. Oliveira, M. B. Barbosa, J. N. Gonçalves, J. Schell, T. M. Mendonça, J.G. Correia, A.M.L. Lopes and J. P. Araujo, Jornadas do CFUM 2015, U. Minho, 20th November, 2015.
2. Dynamic off-centering of Cr³⁺ ions and short-range magneto-electric clusters in CdCr₂S₄, G.N.P. Oliveira, A.M. Pereira, A.M. L. Lopes, J.S. Amaral, A.M. dos Santos, T.M. Mendonça, C.T. Sousa, Y. Ren, V.S. Amaral, J.G. Correia, J.P. Araújo, MAP-fis Conference 2013, Aveiro, Portugal, 18 January, 2013.
3. CdCr₂S₄: Local probing of electric and structural properties, G.N.P. Oliveira, A.M.T. Pereira, J. Amaral, A. dos Santos, T.M. Mendonça, Y. Ren, J.G. Correia, A.M.L. Lopes, J.P. Araújo, FISICA2012-18^a Conferência Nacional de Física, Aveiro – Portugal, 6-8 September, 2012.
4. Ab initio calculation and study of hyperfine properties of layered ferroelectrics doped with magnetic ions and multiferroics, A.S. Fenta, J. N. Gonçalves, V. S. Amaral, J. G. Correia, A. Stroppa, S. Picozzi, Jornadas CICECO, Aveiro, Portugal, 2-3 May, 2012.

2) Group's deliverables with NON - radioactive nuclear methods

Selected Publications

2017

1. State transition and electrocaloric effect in BaZrxTi_{1-x}O₃: Simulation and experiment, Y.-B. Ma, C. Molin, V. V. Shvartsman, S. Gebhardt, D. C. Lupascu, K. Albe, and B.-X. Xu
J. Appl. Phys. 121(2), 024103 (2017)
DOI: <http://dx.doi.org/10.1063/1.4973574>

2016

2. A new (Ba,Ca) (Ti,Zr)O₃ based multiferroic composite with large magnetoelectric effect, M. Naveed-Ul-Haq, V. V. Shvartsman, S. Salamon, H. Wende, H. Trivedi, A. Mumtaz and D. C. Lupascu, Scientific Reports 6, 32164 (2016)
doi:10.1038/srep32164
3. The direct and the converse magnetoelectric effect in multiferroic cobalt ferrite-barium titanate ceramic composites, M. Etier, V. V. Shvartsman, S. Salamon, Y. Gao, H. Wende, and D. C. Lupascu, J. Am. Ceram. Soc. 99(11), 3623-3631 (2016)
DOI: 10.1111/jace.14362
4. Multiferroic Clusters: A New Perspective for Relaxor-Type Room-Temperature Multiferroics, L. F. Henrichs, O. Cespedes, J. Bennett, J. Landers, S. Salomon, C. Heuser, T. Hansen, T. Helbig, O. Gutfleisch, D. C. Lupascu, H. Wende, W. Kleemann and A. J. Bell, Adv. Funct. Mater. , 2111-2121 (2016)
DOI: 10.1002/adfm.201503335
5. The effect of silicon-substrate orientation on the local piezoelectric characteristics of LiNbO₃ films, D. A. Kiselev, R. N. Zhukov, S. V. Ksenich, I. V. Kubasov, A. A. Temirov, N. G. Timushkin, A. S. Bykov, M. D. Malinkovich, V. V. Shvartsman, D. C. Lupascu, and Y. N. Parkhomenko, J. Surf. Investig-X-Ra. 10, 742-747 (2016)
DOI: 10.1134/S1027451016040091

6. Thickness effect on the structure, grain size, and local piezoresponse of self-polarized lead lanthanum zirconate titanate thin films, M. Melo, E. B. Araujo, V. V. Shvartsman, V. Y. Shur, and A. L. Khoklin, *J. Appl. Phys.* 120(5), 054101 (2016)
DOI: <http://dx.doi.org/10.1063/1.4960137>
7. Ultrasonic spectroscopy of copolymer based P(VDF-TrFE) composites with fillers on lead zirconate titanate basis, J. Belovickis, V. Samulionis, J. Banys, M. Sibilin, A. Solnyshkin, Y. Shilyaeva, K. Nekludov, S. Gavrilov, V. Rubanik, and V. V. Shvartsman, *Polymer Testing* 53, 211-216 (2016)
<http://dx.doi.org/10.1016/j.polymertesting.2016.06.001>
8. On the Influence of Ferroelectric Polarization States on the Magneto-electric Coupling in Two-phase Composites, M. Labusch, M.-A. Keip, V. V. Shvartsman, D. C. Lupascu, and J. Schröder, *Technische Mechanik* 36, 73-87 (2016)
9. Electrocaloric Effect in Ba(Zr,Ti)O₃-(Ba,Ca)TiO₃ Ceramics Measured Directly, M. Sanlialp, V. V. Shvartsman, M. Acosta, and D. C. Lupascu, *J. Am. Ceram. Soc.* 99(12), 4022-4030 (2016)
doi: 10.1111/jace.14456
10. Modified Differential Scanning Calorimeter for Direct Electrocaloric Measurements, M. Sanlialp, C. Molin, V. V. Shvartsman, S. Gebhardt, and D. C. Lupascu, *IEEE T Ultrason Ferr.* 63(10), 1690-1696 (2016)
<http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7515216&tag=1>
11. Infrared reflectivity investigation of the phase transition sequence in Pr_{0.5}Ca_{0.5}MnO₃, J. L. Ribeiro, L. G Vieira, I. T. Gomes et al., *Journal of Magnetism and Magnetic Materials*, 408, 81-88 (2016)
doi: 10.1016/j.jmmm.2016.02.026
12. Magnetocaloric effect and refrigerant capacity in polycrystalline YCrO₃, G. N. P. Oliveira,, P. Machado, A. L. Pires; et al., *Journal Of Physics And Chemistry Of Solids*, 91, 182-188 (2016)
doi:10.1016/j.jpcs.2015.12.012
13. Breaking the geometric magnetic frustration in controlled off-stoichiometric LuMn_{1+z}O_{3+delta} compounds, F. G. Figueiras, D. Karpinsky, P.B. Tavares, et al., *Physical Chemistry Chemical*, 13519-13523 (2016).
doi: 10.1039/c6cp01562j
14. Nanodomains Coupled to Ferroelectric Domains Induced by Lattice Distortion in Self-Doped LuMnxO_{3 + -delta} Hexagonal Ceramics, *Journal of Physical Chemistry C*, 120, 21897-21904 (2016)
doi: 10.1021/acs.jpcc.6b04478
15. Magnetoelectric Effect Probe Through ppm Fe Doping in BaTiO₃, F.G. Figueiras, C.O Amorim, J. Amaral, J.A. Moreira, P.B. Tavares, E. Alves; V.S. Amaral, *J. of Alloys and Compounds* 661, 495-500 (2016)
doi:<http://dx.doi.org/10.1016/j.jallcom.2015.11.199>

2015

16. Crystal structure, magnetic and dielectric behavior of h-LuMnxO_{3 + -delta} ceramics, Baghizadeh, A.; Vieira, J. M.; Amaral, J. S.; et al., *Journal of Magnetism and Magnetic Materials*, 395, 303-311 (2015)
doi: 10.1016/j.jmmm.2015.07.082

17. Peculiar Magnetoelectric Coupling in BaTiO₃:Fe-113 ppm Nanoscopic Segregations, Amorim, C. O.; Figueiras, F.; Amaral, J. S.; et al., *Acs Applied Materials & Interfaces*, 24741-24747 (2015).
doi: 10.1021/acsami.5b07462
18. Time-resolved X-ray diffraction reveals the hidden mechanism of high piezoelectric activity in a uniaxial ferroelectric, S. Gorfman, H. Choe, V. V. Shvartsman, M. Ziolkowski, M. Vogt, J. Strempfer, T. Lukasiewicz, U. Pietsch and J. Dec, *Phys. Rev. Lett.* 114, 097601 (2015)
DOI:<https://doi.org/10.1103/PhysRevLett.114.097601>
19. Polarization reversal in organic-inorganic ferroelectric composites: Modeling and experiment, M. V. Sibilin, J. Belovickis, S. Svirskas, M. Ivanov, J. Banys, A. V. Solnyshkin, S. A. Gavrilov, O. V. Varenyk, A. S. Pusenkova, N. Morozovsky, V. V. Shvartsman, and A. N. Morozovska, *Appl. Phys Lett.* 107, 142907 (2015)
DOI: <http://dx.doi.org/10.1063/1.4932661>
20. Local manifestations of a static magnetoelectric effect in nanostructured BaTiO₃-BaFe₁₂O₉ composite multiferroics, H. Trivedi, V. V. Shvartsman, D. C. Lupascu, M. S. A. Medeiros, R. C. Pullar, A. L. Kholkin, P. Zelenovskiy, A. Sosnovskikh, and V. Y. Shur, *Nanoscale* 7, 4489-4496 (2015)
DOI: 10.1039/C4NR05657D
21. Dynamic pyroelectric response of composite based on ferroelectric copolymer of poly(vinylidene fluoride-trifluoroethylene) and ferroelectric ceramics of barium lead zirconate titanate, A.V. Solnyshkin, I. M. Morsakov, A. A. Bogomolov, A. N. Belov, M. I. Vorobiev, V. I. Shevyakov, M. V. Silibin, and V. V. Shvartsman, *Appl. Phys. A* 121, 311-316 (2015)
DOI: 10.1007/s00339-015-9446-z
22. Measuring the magnetoelectric effect across scales, D. C. Lupascu, H. Wende, M. Etier, A. Nazrabi, I. Anusca, H. Trivedi, V. V. Shvartsman, J. Landers, S. Salamon, and C. Schmitz-Antoniak, *GAMM-Mitt.* 38, 25-74 (2015)
DOI: 10.1002/gamm.201510003
23. Quantitative phase separation in multiferroic Bi_{0.88}Sn_{0.12}FeO₃ ceramics via piezoresponse force microscopy, D. O. Alikin, A. P. Turygin, J. Walker, T. Rojac, V. V. Shvartsman, V. Y. Shur, and A. L. Kholkin, *J. Appl. Phys.* 118, 072004 (2015)
DOI: <http://dx.doi.org/10.1063/1.4927812>
24. Magnetodielectric effect in relaxor/ferrimagnetic composites, M. Naveed Ul-Haq, T. Yunus, A. Mumtaz, V. V. Shvartsman, and D. C. Lupascu, *J. Alloy Compd.* 640, 462-467 (2015)
<http://dx.doi.org/10.1016/j.jallcom.2015.03.215>
25. Magnetoelectric coupling on multiferroic cobalt ferrite-barium titanate ceramic composites with different connectivity schemes, M. Etier, C. Schmitz-Antoniak, S. Salamon, H. Trivedi, Y. Gao, A. Nazrabi, J. Landers, D. Gautam, M. Winterer, D. Schmitz, H. Wende, V. V. Shvartsman, and D. C. Lupascu, *Acta Materialia* 90, 1-9 (2015)
<http://dx.doi.org/10.1016/j.actamat.2015.02.032>
26. Effect of dopants on the electrocaloric effect of 0.92 Pb(Mg_{1/3}Nb_{2/3})O₃-0.08 PbTiO₃ ceramics, C. Molin, M. Sanlialp, V. V. Shvartsman, D. C. Lupascu, P. Neumeister, A. Schönecker, and S. Gebhardt, *J. Eur. Ceram. Soc.* 35(7), 2065-2071 (2015)
<http://dx.doi.org/10.1016/j.eurceramsoc.2015.01.016>

27. Strong electrocaloric effect in lead-free $0.65\text{Ba}(\text{Zr}_{0.2}\text{Ti}_{0.8})\text{O}_3$ - $0.35(\text{Ba}_{0.7}\text{Ca}_{0.3})\text{TiO}_3$ ceramics obtained by direct measurements, M. Sanlialp, V. V. Shvartsman, M. Acosta, B. Dkhil, and D. C. Lupascu, *Appl. Phys. Lett.* 106, 062901 (2015)
DOI: <http://dx.doi.org/10.1063/1.4907774>
28. Peculiar Magnetoelectric Coupling in $\text{BaTiO}_3:\text{Fe}_{113\text{ppm}}$ Nanoscopic Segregations, C. O. Amorim, F. Figueiras, J. Amaral, P. Vaghefi, P. Tavares, M. Correia, Ali B., E. Alves, J. Rocha, V. s. Amaral, *ACS Applied Materials & Interfaces* 7 (44) 24741–24747 (2015).
doi:<http://dx.doi.org/10.1021/acsami.5b07462>

2014

29. Room temperature synthesis of $\text{Bi}_{25}\text{FeO}_{39}$ and hydrothermal kinetic relations between sillenite- and distorted perovskite-type bismuth ferrites, Armandina M. L. Lopes, Joao P. Araujo; Stanislav Ferdov, *Dalton Trans.*, 43, 18010-18016 (2014)
doi: 10.1039/C4DT01825G
30. Local bias induced ferroelectricity in manganites with competing charge and orbital order states, Figueiras, Fabio G. N.; Bdikin, Igor K.; Amaral, Vitor B. S.; et al., *Physical Chemistry Chemical Physics*, 16, 4977-4981 (2014)
doi: 10.1039/c4cp00075g doi: 10.1039/C4DT01825G
31. Unravelling the effect of SrTiO_3 antiferrodistortive phase transition on the magnetic properties of $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ thin films, Mota, D. A.; Romaguera Barcelay, Y.; Senos, A. M. R.; et al., *Journal of Physics D-Applied Physics*, 47, 435002 (2014).
doi: 10.1088/0022-3727/47/43/435002
32. Macroscopic and Nanoscopic Polarization Relaxation Kinetics in Lead-Free Relaxors $\text{Bi}_{1/2}\text{Na}_{1/2}\text{TiO}_3$ - $\text{Bi}_{1/2}\text{K}_{1/2}\text{TiO}_3$ - $\text{BiZn}_{1/2}\text{Ti}_{1/2}\text{O}_3$, D. Gobeljic, R. Dittmer, J. Rödel, V. V. Shvartsman, and D. C. Lupascu, *J. Am. Ceram. Soc.* 97(12), 3904-3912 (2014)
DOI: 10.1111/jace.13227
33. Mössbauer Study of Temperature-Dependent Cycloidal Ordering in BiFeO_3 Nanoparticles
J. Landers, S. Salamon, M. Escobar Castillo, D. C. Lupascu, and H. Wende
Nano Letters 14(11), 6061-6065 (2014)
DOI: 10.1021/nl5031375
34. Dielectric Properties of $0.9\text{AgO}_{0.9}\text{Li}_{0.1}\text{NbO}_3$ - $0.1\text{BiO}_{0.5}\text{K}_{0.5}\text{TiO}_3$ Ceramics, J. Pozingis, J. Macutkevic, R. Grigalaitis, J. Banys, and D. C. Lupascu, *Ferroelectrics* 463, 99-104 (2014)
<http://dx.doi.org/10.1080/00150193.2014.892358>
35. Structure and dielectric properties of $(1-x)\text{AgO}_{0.9}\text{Li}_{0.1}\text{NbO}_3$ - $(x)\text{Bi}_{0.5}\text{K}_{0.5}\text{TiO}_3$ ferroelectric ceramics, J. Pozingis, J. Macutkevic, R. Grigalaitis, J. Banys, and D. C. Lupascu, *Ceramics International* 40, 9961-9969 (2014)
<http://dx.doi.org/10.1016/j.ceramint.2014.02.094>
36. Giant mechanically-mediated electrocaloric effect in ultrathin ferroelectric capacitors at room temperature, Y. Liu, I. C. Infante, X. Lou, D. C. Lupascu, and B. Dkhil, *Appl. Phys. Lett.* 104, 012907 (2014)
DOI: <http://dx.doi.org/10.1063/1.4861456>
37. Temperature dependence of the local piezoresponse in $(\text{K},\text{Na})\text{NbO}_3$ -based ceramics with large electromechanical strainD. Gobeljic, V. V. Shvartsman, K. Wang, F. Yao, J.-F. Li, W. Jo, J. Rödel, and D. C. Lupascu, *J. Appl. Phys.* 116, 066811 (2014)
DOI: <http://dx.doi.org/10.1063/1.4891398>

38. Nanocrystalline barium strontium titanate ceramics synthesized via the "organosol" route and Spark Plasma Sintering, Y. Gao, V. V. Shvartsman, D. Gautam, M. Winterer, and D. C. Lupascu, *J. Am. Ceram. Soc.* 97, 2139-2146 (2014)
DOI: 10.1111/jace.12933
39. Ergodicity reflected in macroscopic and microscopic field-dependent behavior of BNT-based relaxors, R. Dittmer, D. Gobeljic, W. Jo, V. V. Shvartsman, D. C. Lupascu, J. L. Jones, and J. Rödel, *J. Appl. Phys.* 115 (8), 084111 (2014)
DOI: <http://dx.doi.org/10.1063/1.4867157>
40. Product properties of a two-phase magneto-electric composite: Synthesis and numerical modelling, M. Labusch, M. Etier, D. C. Lupascu, J. Schröder, and M.-A. Keip, *Comput. Mech.* 54, 71-83 (2014)
DOI 10.1007/s00466-014-1031-3

2013

41. Piezoelectric characteristics of LiNbO₃ thin-film heterostructures via piezoresponse force microscopy, D. A. Kiselev, S. V. Ksenich, R. N. Zhukov, A. S. Bykov, M. D. Malinkovich, V. V. Shvartsman, D. C. Lupascu, and Y. N. Parkhomenko, *J. Nano-Electron. Phys.* 5, 04041 (2013)
http://jnep.sumdu.edu.ua/en/component/content/full_article/1105
42. Local ferroelectric properties in polyvinylidene fluoride/barium lead zirconate titanate nanocomposite: Interface effect, M. V. Silibin, A. V. Solnyshkin, D. A. Kiselev, A. N. Morozovska, E. A. Eliseev, S. A. Gavrilov, M. D. Malinkovich, D. C. Lupascu, and V. V. Shvartsma, *J. Appl. Phys.* 114, 144102 (2013)
DOI: <http://dx.doi.org/10.1063/1.4824463>
43. Magnetoelectric effect in (0-3) CoFe₂O₄-BaTiO₃(20/80) composite ceramics prepared by the organosol route, M. Etier, V. V. Shvartsman, Y. Gao, J. Landers, H. Wende, and D. C. Lupascu, *Ferroelectrics* 448, 77-85 (2013)
<http://dx.doi.org/10.1080/00150193.2013.822292>
44. Effect of particle size on ferroelectric and magnetic properties of BiFeO₃ nanopowders, M. Escobar Castillo, V. V. Shvartsman, D. Gobeljic, Y. Gao, J. Landers, H. Wende, and D. C. Lupascu, *Nanotechnology* 24, 355701 (2013)
<http://iopscience.iop.org/article/10.1088/0957-4484/24/35/355701>
45. Preparation of SiO₂ Encapsulated BaTiO₃ Nanoparticles with Tunable Shell Thickness by Reverse Microemulsion, Y. Gao, A. Elsukova, D.C. Lupascu, Particle and Particle Systems Characterization 30 (10), 832-836 (2013)
DOI: 10.1002/ppsc.201300104
46. Comment on "The Origin of Magnetism in Mn-Doped SrTiO₃", A. Tkach, P. M. Vilarinho, W. Kleemann, V. V. Shvartsman, P. Borisov, and S. Bedanta, *Adv. Funct. Mater.* 23, 2229-2230 (2013)
DOI: 10.1002/adfm.201202314
47. Temperature-insensitive (K,Na)NbO₃-based lead-free piezoactuator ceramics, K. Wang, F.-Z. Yao, W. Jo, D. Gobeljic, V. V. Shvartsman, D. C. Lupascu, J.-F. Li, and J. Rödel, *Adv. Funct. Mater.* 23, 4079-4086 (2013)
48. V. V. Shvartsman, B. Dkhil, and A. L. Kholkin
Mesoscale domains and nature of the relaxor state by piezoresponse force microscopy
Annu. Rev. Mater. Res. 43, 423-449 (2013)
DOI: 10.1002/adfm.201203754

49. Macroscopic and local piezoelectric properties of Pb(Mg $1/3$ Nb $2/3$)O 3 -PbTiO 3 single crystals exhibiting giant piezoelectric response, V. V. Shvartsman, A. L. Khoklin, I. P. Raevski, S. I. Raevskaya, F. I. Savenko, and A. S. Emelyanov, *J. Appl. Phys.* 113, 87208 (2013)
DOI: <http://dx.doi.org/10.1063/1.4801964>
50. Room temperature structure and multiferroic properties in Bi 0.7 La 0.3 FeO 3 ceramics, Carvalho, T. T.; Fernandes, J. R. A.; Perez de la Cruz, J.; et al., *Journal of Alloys and Compounds*, 554, 97-103 (2013)
DOI: 10.1016/j.jallcom.2012.11.018

2012

51. Magnetoelectric coupling in multiferroic heterostructure of rf-sputtered Ni-Mn-Ga thin film on PMN-PT, Teferi, M. Y.; Amaral, V. S.; Lounrenco, A. C.; et al., *Journal of Magnetism and Magnetic Materials*, 324, 1872-1876, (2012)
doi: 10.1016/j.jmmm.2012.01.010
52. Mn doping-induced structural and magnetic transformations in the antiferroelectric phase of the Bi $1-x$ Nd x FeO 3 perovskites, V. A. Khomchenko, I. O. Troyanchuk, T. M. Maria, V. S. Amaral et al., *Journal of Applied Physics*, 112, 064105, (2012).
doi: 10.1063/1.4752277
53. Structural transitions and unusual magnetic behavior in Mn-doped Bi $1-x$ LaxFeO 3 perovskites, V. A. Khomchenko, I. O. Troyanchuk, D. V. Karpinsky et al., *Journal of Applied Physics*, 112, 084102 (2012)
DOI: 10.1063/1.4759435
54. Cobalt ferrite/barium titanate core/shell nanoparticles, M. Etier, Y. Gao, V. V. Shvartsman, A. Elsukova, J. Landers, H. Wende, and D. C. Lupascu, *Ferroelectrics* 438, 115-122 (2012)
<http://dx.doi.org/10.1080/00150193.2012.743773>
55. Phase diagram of mixed Cu(In x Cr $1-x$)P 2 S 6 crystals, A. Dziaugys, V. V. Shvartsman, J. Macutkevic, J. Banys, Yu. Vysochanskii, and W. Kleemann, *Phys. Rev. B* 85, 134105 (2012)
DOI:<https://doi.org/10.1103/PhysRevB.85.134105>
56. Synthesis and Characterization of BaTiO 3 Nanopowders and BaTiO 3 /CoFe 2 O 4 Nanocomposites; Yanling Gao and Doru C. Lupascu, *Mater. Res. Soc. Symp. Proc.* Vol. 1397 (2012)
DOI: 10.1557//opl.2012.1013
57. Lead free relaxor ferroelectrics, V. V. Shvartsman and D. C. Lupascu, *J. Am. Ceram. Soc.* 95, 1-26 (2012), DOI: 10.1111/j.1551-2916.2011.04952.x
58. Magnetic anomaly and dielectric tunability of (Sr,Mn)TiO 3 thin films, A. Tkach, O. Okhay, A. Y. Wu, P. M. Vilarinho, S. Bedanta, V. V. Shvartsman, and W. Kleemann, *Ferroelectrics* 426, 274-281 (2012)
<http://dx.doi.org/10.1080/00150193.2012.672038>
59. Low-temperature synthesis of crystalline BaTiO 3 nanoparticles by one-step "organosol"-precipitation, Yanling. Gao, V. V. Shvartsman, A. Elsukova, and D. C. Lupascu, *J. Mater. Chem.* 22, 17573-17583 (2012)
DOI: 10.1039/C2JM33373B

60. Polar structures of PbMg_{1/3}Nb_{2/3}O₃-PbTiO₃ relaxors: piezoresponse force microscopy approach, V. V. Shvartsman and A. L. Kholkin, *J. Adv. Dielectr.* 2, 1241003 (2012)
DOI: <http://dx.doi.org/10.1142/S2010135X12410032>
61. Multiferroic and magnetoelectric materials – developments and perspectives, W. Kleemann, P. Borisov, V. V. Shvartsman, and S. Bedanta, *EPJ Web of Conferences* 29, 00046 (2012)
<https://doi.org/10.1051/epjconf/20122900046>
62. From mesoscopic to global polar order in the uniaxial relaxor ferroelectric Sr_{0.8}Ba_{0.2}Nb₂O₆, J. Dec, W. Kleemann, V. V. Shvartsman, D. C. Lupascu, and T. Łukasiewicz, *Appl. Phys. Lett.* 100, 052903 (2012)
DOI: <http://dx.doi.org/10.1063/1.3680599>