

Reference:

- [1] A. Pal, P. Singh, V.K. Gangwar, S. Ghosh, P. Prakash, S.K. Saha, A. Das, M. Kumar, A.K. Ghosh, S. Chatterjee, B-site disorder driven multiple-magnetic phases: Griffiths phase, re-entrant cluster glass, and exchange bias in $\text{Pr}_2\text{CoFeO}_6$, *Appl. Phys. Lett.* 114 (2019). <https://doi.org/10.1063/1.5094905>.
- [2] R.I. Dass, J.B. Goodenough, Multiple magnetic phases of $\text{La}_2\text{CoMnO}_{6-\delta}$ ($0 \leq \delta \leq 0.05$), *Phys. Rev. B-Condens. Matter Mater. Phys.* 67 (2003) 144011–144019. <https://doi.org/10.1103/physrevb.67.014401>.
- [3] J.B. Goodenough, Theory of the role of covalence in the perovskite-type manganites $[\text{La}, \text{M(II)}]\text{MnO}_3$, *Phys. Rev.* 100 (1955) 564–573. <https://doi.org/10.1103/PhysRev.100.564>.
- [4] R. Shukla, A. Jain, M. Miryala, M. Murakami, K. Ueno, S.M. Yusuf, R.S. Dhaka, Spin Dynamics and Unconventional Magnetism in Insulating $\text{La}_{1-2x}\text{Sr}_{2x}\text{Co}_{1-x}\text{Nb}_x\text{O}_3$, *J. Phys. Chem. C* 123 (2019) 22457–22469. <https://doi.org/10.1021/acs.jpcc.9b05423>.
- [5] M. Rotter, Z.S. Wang, A.T. Boothroyd, D. Prabhakaran, A. Tanaka, M. Doerr, Mechanism of spin crossover in LaCoO_3 resolved by shape magnetostriction in pulsed magnetic fields, *Sci. Rep.* 4 (2014) 1–4. <https://doi.org/10.1038/srep07003>.
- [6] X. Li, H. Yu, F. Lou, J. Feng, M.H. Whangbo, H. Xiang, Spin Hamiltonians in magnets: Theories and computations, *Molecules* 26 (2021) 1–26. <https://doi.org/10.3390/molecules26040803>.

- [7] Z. Hu, H. Wu, M.W. Haverkort, H.H. Hsieh, H. Lin, T. Lorenz, J. Baier, A. Reichl, I. Bonn, C. Felser, A. Tanaka, C.T. Chen, L.H. Tjeng, J. Gutenberg-universita, Different Look at the Spin State of Co^{3+} Ions in a CoO 5 Pyramidal Coordination, (2004) 3–6. <https://doi.org/10.1103/PhysRevLett.92.207402>.
- [8] H. Wu, T. Burnus, Hua Wu 1 and T. Burnus 2 1, (2009) 3–6. <https://doi.org/10.1103/PhysRevB.80.081105>.
- [9] D. Meier, H. Ryll, K. Kiefer, B. Klemke, J.-U. Hoffmann, R. Ramesh, M. Fiebig, Mutual induction of magnetic d and f order in multiferroic hexagonal ErMnO_3 , Phys. Rev. B 86 (2012) 184415. <https://doi.org/10.1103/PhysRevB.86.184415>.
- [10] Z.X. Cao, Intermediate sp -hybridization for chemical bonds in nonplanar covalent molecules of carbon, Chinese Phys. B 23 (2014). <https://doi.org/10.1088/1674-1056/23/6/063102>.
- [11] W. Wu, Z. Xue, X. Hong, X. Li, Y. Guo, Analysis of the valence electronic structures and calculation of the physical properties of Fe, Co, and Ni, Sci. China, Ser. G Physics, Mech. Astron. 52 (2009) 864–868. <https://doi.org/10.1007/s11433-009-0103>
- [12] S. Huang, Q. Zhao, Z. Yang, C. Lin, Y. Zhao, J. Yu, Strengthening effects of Al element on strength and impact toughness in titanium alloy, J. Mater. Res. Technol. 26 (2023) 504–516. <https://doi.org/10.1016/j.jmrt.2023.07.206>.
- [13] S. Yáñez-Vilar, E.D. Mun, V.S. Zapf, B.G. Ueland, J.S. Gardner, J.D. Thompson, J. Singleton, M. Sánchez-Andújar, J. Mira, N. Biskup, M.A. Señarís-Rodríguez, C.D.

- Batista, Multiferroic behavior in the double-perovskite $\text{Lu}_2\text{MnCoO}_6$, *Phys. Rev. B - Condens. Matter Mater. Phys.* **84** (2011) 1–8. <https://doi.org/10.1103/PhysRevB.84.134427>.
- [14] A. Khan, S. Chatterjee, T.K. Nath, A. Taraphder, Defect-induced modulation of magnetic, electronic and optical properties of $\text{La}_2\text{CoMnO}_6$ double perovskite oxide, *6* (2021) 1–14.
- [15] J.K. Murthy, A. Venimadhav, 4 f-3 d exchange coupling induced exchange bias and field induced Hopkinson peak effects in $\text{Gd}_2\text{CoMnO}_6$, *J. Alloys Compd.* **719** (2017) 341–346. <https://doi.org/10.1016/j.jallcom.2017.05.203>.
- [16] J.Y. Moon, M.K. Kim, D.G. Oh, J.H. Kim, H.J. Shin, Y.J. Choi, N. Lee, Anisotropic magnetic properties and giant rotating magnetocaloric effect in, (n.d.).
- [17] N. Lee, J.H. Kim, D.G. Oh, H.J. Shin, H.Y. Choi, S. Choi, Y. Jo, Y.J. Choi, Tunable magnetization steps in mixed valent ferromagnet $\text{Eu}_2\text{CoMnO}_6$, *Sci. Rep.* **11** (2021) 1–9. <https://doi.org/10.1038/s41598-021-88950-w>.
- [18] D. Mazumdar, I. Das, Role of 3d–4f exchange interaction and local anti-site defects in the magnetic and magnetocaloric properties of double perovskite $\text{Ho}_2\text{CoMnO}_6$ compound, (2021). <https://doi.org/10.1063/5.0041257>.
- [19] L.T. Coutrim, D. Rigitano, C. Macchiutti, T.J.A. Mori, R. Lora-Serrano, E. Granado, E. Sadrollahi, F.J. Litterst, M.B. Fontes, E. Baggio-Saitovitch, E.M. Bittar, L. Bufaiçal, Zero-field-cooled exchange bias effect in phase-segregated $\text{La}_{2-x}\text{A}_x\text{CoMnO}_{6-\delta}$ (A=Ba, Ca, Sr; x=0,0.5) ZERO-FIELD-COOLED EXCHANGE BIAS

- EFFECT in ... L. T. COUTRIM et al., Phys. Rev. B 100 (2019) 54428.
<https://doi.org/10.1103/PhysRevB.100.054428>.
- [20] L. Sr, À. Ba, Tuning the spontaneous exchange bias, 5 (2020) 1–5.
<https://doi.org/10.1063/5.0028663>.
- [21] R.C. Sahoo, S. Das, D. Daw, R. Singh, A. Das, T.K. Nath, Tuning of multi-magnetic phase and exchange bias effect by antisite disorder in Ca-doped La₂CoMnO₆ double perovskites, (2021).
- [22] J.K. Murthy, K.D. Chandrasekhar, S. Mahana, D. Topwal, Giant magnetocaloric effect in Gd₂NiMnO₆ and Gd₂CoMnO₆ ferromagnetic insulators, 1 (n.d.) 1–14.
- [23] K. Anand, M. Alam, A. Pal, P. Singh, S. Kumari, A.G. Joshi, A. Das, A. Mohan, S. Chatterjee, Journal of Magnetism and Magnetic Materials Existence of Griffiths phase and unusual spin dynamics in double perovskite Tb₂CoMnO₆, J. Magn. Magn. Mater. 528 (2021) 167697. <https://doi.org/10.1016/j.jmmm.2020.167697>.
- [24] K. Anand, A. Pal, M. Alam, S. Dan, Emergence of metamagnetic transition, re-entrant cluster glass and spin-phonon coupling in Tb₂CoMnO₆, (n.d.).
- [25] M. Zhu, Y. Lin, E.W.C. Lo, Q. Wang, Z. Zhao, W. Xie, Electronic and magnetic properties of La₂NiMnO₆ and La₂CoMnO₆ with cationic ordering □, 062406 (2012). <https://doi.org/10.1063/1.3683550>.
- [26] Y. Comno, Metamagnetic behavior and effect of field cooling on sharp magnetization jumps in multiferroic Metamagnetic behavior and effect of field cooling on sharp magnetization jumps in multiferroic Y₂CoMnO₆, (2014) 0–6.

<https://doi.org/10.1209/0295-5075/108/27013>.

- [27] A. Venimadhav, D. Chandrasekar, J. Krishna Murthy, Intrinsic and extrinsic contributions to magnetodielectric effect in double perovskite $\text{La}_2\text{CoMnO}_6$ nanoparticles, *Appl. Nanosci.* 3 (2013) 25–28. <https://doi.org/10.1007/s13204-012-0069-9>.
- [28] H.S. Nair, T. Chatterji, A.M. Strydom, Antisite disorder-induced exchange bias effect in multiferroic Y_2CoMnO_6 , *022407* (2015) 1–5. <https://doi.org/10.1063/1.4906204>.
- [29] J. Yin, Multicaloric effect in multiferroic Y_2CoMnO_6 , (2014). <https://doi.org/10.1088/0022-3727/47/44/445002>.
- [30] double perovskites: The role of electronic and cationic disorder Haripriya, G. R. Contrasting the magnetism in $\text{La}_{2-x}\text{Sr}_x\text{FeCoO}_6$ ($x=0, 1$), C.M.N. Kumar, R. Pradheesh, L.M. Martinez, C.L. Saiz, S.R. Singamaneni, T. Chatterji, V. Sankaranarayanan, K. Sethupathi, B. Kiefer, H.S. Nair, Contrasting the magnetism in $\text{La}_{2-x}\text{Sr}_x\text{FeCoO}_6$ ($x=0,1,2$) double perovskites: The role of electronic and cationic disorder, *Phys. Rev. B* 99 (2019) 1–9. <https://doi.org/10.1103/PhysRevB.99.184411>.
- [31] H. Labrim, A. Jabar, A. Belhaj, S. Ziti, L. Bahmad, L. Laânab, A. Benyoussef, Magnetic properties of $\text{La}_2\text{FeCoO}_6$ double perovskite : Monte Carlo study, *J. Alloys Compd.* 641 (2015) 37–42. <https://doi.org/10.1016/j.jallcom.2015.04.068>.
- [32] A. Pal, S. Ghosh, A.G. Joshi, S. Kumar, S. Patil, P.K. Gupta, P. Singh, V.K. Gangwar, P. Prakash, R.K. Singh, E.F. Schwier, M. Sawada, K. Shimada, A.K. Ghosh, A. Das, S. Chatterjee, Investigation of multi-mode spin-phonon coupling and local B-site

- disorder in $\text{Pr}_2\text{CoFeO}_6$ by Raman spectroscopy and correlation with its electronic structure by XPS and XAS studies, (2019).
- [33] A. Pal, P. Singh, V.K. Gangwar, S. Ghosh, P. Prakash, S.K. Saha, A. Das, M. Kumar, A.K. Ghosh, S. Chatterjee, B-site disorder driven multiple-magnetic phases: Griffiths phase, re-entrant cluster glass, and exchange bias in $\text{Pr}_2\text{CoFeO}_6$, (2019). <https://doi.org/10.1063/1.5094905>.
- [34] R.B. Griffiths, Nonmagnetic behavior above the critical point in a random Ising ferromagnet, *Phys. Rev. Lett.* 23 (1969) 17–19.
- [35] C. He, M.A. Torija, J. Wu, J.W. Lynn, H. Zheng, J.F. Mitchell, C. Leighton, Non-Griffiths-like clustered phase above the Curie temperature of the doped perovskite cobaltite $\text{La}_{1-x}\text{Sr}_x\text{CoO}_3$, *Phys. Rev. B - Condens. Matter Mater. Phys.* 76 (2007) 1–5. <https://doi.org/10.1103/PhysRevB.76.014401>.
- [36] M.B. Salamon, P. Lin, S.H. Chun, Colossal magnetoresistance is a Griffiths singularity, *Phys. Rev. Lett.* 88 (2002) 1972031–1972034. <https://doi.org/10.1103/PhysRevLett.88.197203>.
- [37] A.K. Pramanik, A. Banerjee, Griffiths phase and its evolution with Mn-site disorder in the half-doped manganite $\text{Pr}_{0.5}\text{Sr}_{0.5}\text{Mn}_{1-y}\text{Ga}_y\text{O}_3$ ($y=0.0, 0.025, \text{ and } 0.05$), *Phys. Rev. B - Condens. Matter Mater. Phys.* 81 (2010) 1–5. <https://doi.org/10.1103/PhysRevB.81.024431>.
- [38] K. Ghosh, C. Mazumdar, R. Ranganathan, S. Mukherjee, Griffiths phase behavior in a frustrated antiferromagnetic intermetallic compound, *Sci. Rep.* 5 (2015).

<https://doi.org/10.1038/srep15801>.

- [39] W. Jiang, X. Zhou, R. Privezentsev, Y. Mukovskii, G. Williams, Correlation between the nucleation of a Griffiths-like Phase and Colossal Magnetoresistance across the compositional metal-insulator boundary in $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$, *J. Phys. Conf. Ser.* 200 (2010) 6–10. <https://doi.org/10.1088/1742-6596/200/1/012072>.
- [40] A.K. Pramanik, A. Banerjee, Phase separation and the effect of quenched disorder in $\text{Pr}_{0.5}\text{Sr}_{0.5}\text{MnO}_3$, *J. Phys. Condens. Matter* 20 (2008). <https://doi.org/10.1088/0953-8984/20/27/275207>.
- [41] E. Batsaikhan, C.H. Lee, H. Hsu, C.M. Wu, J.C. Peng, M.H. Ma, S. Deleg, W.H. Li, Largely Enhanced Ferromagnetism in Bare CuO Nanoparticles by a Small Size Effect, *ACS Omega* 5 (2020) 3849–3856. <https://doi.org/10.1021/acsomega.9b02913>.
- [42] Y.B. Yang, X.B. Ma, X.G. Chen, J.Z. Wei, R. Wu, J.Z. Han, H.L. Du, C.S. Wang, S.Q. Liu, Y.C. Yang, Y. Zhang, J.B. Yang, Structure and exchange bias of $\text{Ni}_{50}\text{Mn}_{37}\text{Sn}_{13}$ ribbons, *J. Appl. Phys.* 111 (2012). <https://doi.org/10.1063/1.3672244>.
- [43] C. Jin, Y. Zhu, W. Han, Q. Liu, S. Hu, Y. Ji, Z. Xu, S. Hu, M. Ye, L. Chen, Exchange bias in flexible freestanding $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3/\text{BiFeO}_3$ membranes, *Appl. Phys. Lett.* 117 (2020) 0–6. <https://doi.org/10.1063/5.0032693>.
- [44] L. Wee, R.L. Stamps, L. Malkinski, Z. Celinski, D. Skrzypek, Thermal training of exchange bias in epitaxial Fe/KNiF_3 , *Phys. Rev. B - Condens. Matter Mater. Phys.* 69 (2004) 1–10. <https://doi.org/10.1103/PhysRevB.69.134425>.
- [45] S.K.S. Patel, J.H. Lee, M.K. Kim, B. Bhoi, S.K. Kim, Single-crystalline Gd-doped

- BiFeO₃ nanowires: R 3 c -to- Pn 21 a phase transition and enhancement in high-coercivity ferromagnetism, *J. Mater. Chem. C* 6 (2018) 526–534. <https://doi.org/10.1039/c7tc05362b>.
- [46] W. Yuan, T. Su, Q. Song, W. Xing, Y. Chen, T. Wang, Z. Zhang, X. Ma, P. Gao, J. Shi, W. Han, Crystal Structure Manipulation of the Exchange Bias in an Antiferromagnetic Film, *Sci. Rep.* 6 (2016). <https://doi.org/10.1038/srep28397>.
- [47] K. Binder, A.P. Young, Spin glasses: Experimental facts, theoretical concepts, and open questions, *Rev. Mod. Phys.* 58 (1986) 801–976. <https://doi.org/10.1103/RevModPhys.58.801>.
- [48] C. Djurberg, P. Svedlindh, P. Nordblad, Dynamics of an interacting particle system: Evidence of critical slowing down, *Phys. Rev. Lett.* 79 (1997) 5154–5157. <https://doi.org/10.1103/PhysRevLett.79.5154>.
- [49] M.D. Mukadam, S.M. Yusuf, P. Sharma, S.K. Kulshreshtha, G.K. Dey, Dynamics of spin clusters in amorphous Fe₂O₃, *Phys. Rev. B - Condens. Matter Mater. Phys.* 72 (2005) 1–7. <https://doi.org/10.1103/PhysRevB.72.174408>.
- [50] M. Alam, S. Chatterjee, B-site order/disorder in A₂BB'O₆ and its, (n.d.).
- [51] A. Pal, P. Singh, S. Kumar, S. Ghosh, S.K. Saha, M. Kumar, A. Das, E.F. Schwier, M. Sawada, K. Shimada, A.K. Ghosh, S. Chatterjee, B-site spin-state and anti-site disorder driven multiple-magnetic phases: Griffiths phase, re-entrant cluster glass and exchange bias in double perovskite Pr₂CoFeO₆., *ArXiv Mater. Sci.* (n.d.). <http://arxiv.org/abs/1810.09788>.

- [52] K. Anand, A. Pal, A.G. Joshi, P. Pal, R. Singh, P.T.W. Yen, S.M. Huang, M. Alam, S. Kumari, V. Sathe, S. Chakravarty, A. Mohan, S. Chatterjee, Giant exchange bias in antiferromagnetic $\text{Pr}_2\text{CoFe}_{0.5}\text{Mn}_{0.5}\text{O}_6$: a structural and magnetic properties study, *J. Phys. D. Appl. Phys.* 55 (2022). <https://doi.org/10.1088/1361-6463/ac79da>.
- [53] S. Dani, A. Arya, H. Sharma, R. Kumar, N. Goyal, R. Kumar, R. Pandit, Structural and electronic properties of double perovskite ruthenates; A_2GdRuO_6 (where A = Ba, Sr), *J. Alloys Compd.* 913 (2022) 165177. <https://doi.org/10.1016/j.jallcom.2022.165177>.
- [54] S. Dani, R. Pandit, H. Sharma, A. Arya, R.J. Choudhary, N. Goyal, J. Singh, R. Kumar, Evolution of the valence state of Ru metal ions in correlation with the structural and electronic properties of double perovskite ruthenates; A_2SmRuO_6 (where A = Ba & Sr), *J. Mater. Chem. C* 11 (2023) 4081–4093. <https://doi.org/10.1039/d2tc05072b>.
- [55] M. Das, P. Sarkar, P. Mandal, Non-Griffiths-like cluster formation in the double-perovskite $\text{Gd}_2\text{CoMnO}_6$: Evidence from critical behavior, *Phys. Rev. B* 101 (2020) 144433. <https://doi.org/10.1103/PhysRevB.101.144433>.
- [56] K. Anand, M. Alam, A. Pal, P. Singh, S. Kumari, A.G. Joshi, A. Das, A. Mohan, S. Chatterjee, Existence of Griffiths phase and unusual spin dynamics in double perovskite $\text{Tb}_2\text{CoMnO}_6$, *J. Magn. Magn. Mater.* 528 (2021) 167697. <https://doi.org/10.1016/j.jmmm.2020.167697>.
- [57] K. Anand, A. Pal, M. Alam, S. Dan, S. Kumar, S. Ghosh, S. Kumari, A. Das, M. Sawada, A. Mohan, V.G. Sathe, S. Chatterjee, Emergence of metamagnetic transition,

- re-entrant cluster glass and spin-phonon coupling in Tb₂CoMnO₆, *J. Phys. Condens. Matter* 33 (2021). <https://doi.org/10.1088/1361-648X/abfe94>.
- [58] J.Y. Moon, M.K. Kim, Y.J. Choi, N. Lee, Giant Anisotropic Magnetocaloric Effect in Double-perovskite Gd₂CoMnO₆ Single Crystals, *Sci. Rep.* 7 (2017) 1–10. <https://doi.org/10.1038/s41598-017-16416-z>.
- [59] R. Das, R.N.P. Choudhary, Electrical and magnetic properties of double perovskite: Y₂CoMnO₆, *Ceram. Int.* 47 (2021) 439–448. <https://doi.org/10.1016/j.ceramint.2020.08.151>.
- [60] P.R. Mandal, A. Khan, T.K. Nath, Antisite disorder driven magnetodielectric and magnetocaloric effect in double perovskite La_{2-x}Sr_xCoMnO₆ (x = 0.0, 0.5, 1.0), *J. Appl. Phys.* 128 (2020) 0–10. <https://doi.org/10.1063/1.5135305>.
- [61] A. Khan, S. Chatterjee, T.K. Nath, A. Taraphder, Defect-induced modulation of magnetic, electronic, and optical properties of the double-perovskite oxide, *Phys. Rev. B* 104 (2021) 1–13. <https://doi.org/10.1103/PhysRevB.104.035152>.
- [62] D. Mazumdar, I. Das, Role of 3d-4f exchange interaction and local anti-site defects in the magnetic and magnetocaloric properties of double perovskite Ho₂CoMnO₆ compound, *J. Appl. Phys.* 129 (2021). <https://doi.org/10.1063/5.0041257>.
- [63] R.N. Mahato, K. Sethupathi, V. Sankaranarayanan, Colossal magnetoresistance in the double perovskite oxide La₂CoMnO₆, *J. Appl. Phys.* 107 (2010). <https://doi.org/10.1063/1.3350907>.

- [64] M. Boldrin, A.G. Silva, L.T. Coutrim, J.R. Jesus, C. Macchiutti, E.M. Bittar, L. Bufaiçal, Tuning the spontaneous exchange bias effect with Ba to Sr partial substitution in $\text{La}_{1.5}(\text{Sr}_{0.5-x}\text{Ba}_x)\text{CoMnO}_6$, *Appl. Phys. Lett.* 117 (2020) 1–5. <https://doi.org/10.1063/5.0028663>.
- [65] R.C. Sahoo, S. Das, D. Daw, R. Singh, A. Das, T.K. Nath, Tuning of multi-magnetic phase and exchange bias effect by antisite disorder in Ca-doped $\text{La}_2\text{CoMnO}_6$ double perovskites, *J. Phys. Condens. Matter* 33 (2021). <https://doi.org/10.1088/1361-648X/abead0>.
- [66] J.Y. Moon, M.K. Kim, D.G. Oh, J.H. Kim, H.J. Shin, Y.J. Choi, N. Lee, Anisotropic magnetic properties and giant rotating magnetocaloric effect in double-perovskite $\text{Tb}_2\text{CoMnO}_6$, *Phys. Rev. B* 98 (2018) 1–7. <https://doi.org/10.1103/PhysRevB.98.174424>.
- [67] J.K. Murthy, K.D. Chandrasekhar, S. Murugavel, A. Venimadhav, Investigation of the intrinsic magnetodielectric effect in $\text{La}_2\text{CoMnO}_6$: Role of magnetic disorder, *J. Mater. Chem. C* 3 (2015) 836–843. <https://doi.org/10.1039/c4tc01920b>.
- [68] R. Yadav, T.A. Para, H.A. Reshi, S. Pillai, V. Shelke, Easy synthesis and electric, magneto-transport and magnetic properties of double perovskite $\text{La}_2\text{CoMnO}_6$ compound, *J. Mater. Sci. Mater. Electron.* 28 (2017) 2970–2975. <https://doi.org/10.1007/s10854-016-5882-6>.
- [69] E. Iguchi, K. Ueda, W. Jung, Conduction in LaC by small-polaron hopping below room temperature, *Phys. Rev. B - Condens. Matter Mater. Phys.* 54 (1996) 17431–17437. <https://doi.org/10.1103/PhysRevB.54.17431>.

- [70] R. Plugaru, T. Sandu, N. Plugaru, First-principles study and variable range hopping conductivity in disordered Al/Ti/Mn-doped ZnO, *Results Phys.* 2 (2012) 190–197. <https://doi.org/10.1016/j.rinp.2012.10.004>.
- [71] T. Burnus, Z. Hu, H.H. Hsieh, V.L.J. Joly, P.A. Joy, M.W. Haverkort, H. Wu, A. Tanaka, H.J. Lin, C.T. Chen, L.H. Tjeng, Local electronic structure and magnetic properties of La Mn_{0.5} Co_{0.5} O₃ studied by x-ray absorption and magnetic circular dichroism spectroscopy, *Phys. Rev. B - Condens. Matter Mater. Phys.* 77 (2008) 1–7. <https://doi.org/10.1103/PhysRevB.77.125124>.
- [72] A.N. Vasiliev, O.S. Volkova, L.S. Lobanovskii, I.O. Troyanchuk, Z. Hu, L.H. Tjeng, D.I. Khomskii, H.J. Lin, C.T. Chen, N. Tristan, F. Kretzschmar, R. Klingeler, B. Büchner, Valence states and metamagnetic phase transition in partially B -site-disordered perovskite Eu Mn_{0.5} Co_{0.5} O₃, *Phys. Rev. B - Condens. Matter Mater. Phys.* 77 (2008) 2–6. <https://doi.org/10.1103/PhysRevB.77.104442>.
- [73] M. Li, A. Feteira, D.C. Sinclair, Relaxor ferroelectric-like high effective permittivity in leaky dielectrics/oxide semiconductors induced by electrode effects: A case study of CuO ceramics, *J. Appl. Phys.* 105 (2009). <https://doi.org/10.1063/1.3143014>.
- [74] D.N. Dubey, G. Singh, S. Tripathi, Relaxor ferroelectricity driven by “A” and “B” site off-centered displacements in cubic phase with Pm3m space group, *J. Phys. D. Appl. Phys.* 54 (2021). <https://doi.org/10.1088/1361-6463/ac0bda>.
- [75] H.Y. Choi, J.Y. Moon, J.H. Kim, Y.J. Choi, N. Lee, Single crystal growth of multiferroic double perovskites: Yb₂CoMnO₆ and Lu₂CoMnO₆, *Crystals* 7 (2017) 1–8. <https://doi.org/10.3390/cryst7030067>.

- [76] M. Alam, P. Singh, K. Anand, A. Pal, Extraordinary magnetic properties of double perovskite $\text{Eu}_2\text{CoMnO}_6$ wide band, *J. Phys. Condens. Matter Pap.* 32 (2020) 365802.
- [77] G.Z. Rram, S. Ha, H. Lee, W. Lee, B. Jang, H. Kwon, K. Kim, J. Jang, Effect of Annealing Environment on the Performance, 6 (2019).
- [78] K. Yoshimatsu, H. Wadati, E. Sakai, T. Harada, Y. Takahashi, T. Harano, G. Shibata, K. Ishigami, T. Kadono, T. Koide, T. Sugiyama, E. Ikenaga, H. Kumigashira, M. Lippmaa, M. Oshima, A. Fujimori, Spectroscopic studies on the electronic and magnetic states of Co-doped perovskite manganite $\text{Pr}_{0.8}\text{Ca}_{0.2}\text{Mn}_{1-y}\text{Co}_y\text{O}_3$ thin films, *Phys. Rev. B - Condens. Matter Mater. Phys.* 88 (2013) 1–6. <https://doi.org/10.1103/PhysRevB.88.174423>.
- [79] P.K. Gupta, S. Ghosh, S. Kumar, A. Pal, P. Singh, M. Alam, A. Singh, S. Roy, R. Singh, B.P. Singh, N. Naveen Kumar, E.F. Schwier, M. Sawada, T. Matsumura, K. Shimada, H.J. Lin, Y.Y. Chin, A.K. Ghosh, S. Chatterjee, Room temperature exchange bias in antiferromagnetic composite $\text{BiFeO}_3\text{-TbMnO}_3$, *J. Appl. Phys.* 126 (2019). <https://doi.org/10.1063/1.5109713>.
- [80] Y. Bitla, Y.Y. Chin, J.C. Lin, C.N. Van, R. Liu, Y. Zhu, H.J. Liu, Q. Zhan, H.J. Lin, C. Te Chen, Y.H. Chu, Q. He, Origin of metallic behavior in NiCo_2O_4 ferrimagnet, *Sci. Rep.* 5 (2015) 1–8. <https://doi.org/10.1038/srep15201>.
- [81] S.Y. Istomin, O.A. Tyablikov, S.M. Kazakov, E. V. Antipov, A.I. Kurbakov, A.A. Tsirlin, N. Hollmann, Y.Y. Chin, H.J. Lin, C.T. Chen, A. Tanaka, L.H. Tjeng, Z. Hu, An unusual high-spin ground state of Co^{3+} in octahedral coordination in

- brownmillerite-type cobalt oxide, *Dalt. Trans.* 44 (2015) 10708–10713.
<https://doi.org/10.1039/c4dt03670k>.
- [82] R.N. Mahato, K. Sethupathi, V. Sankaranarayanan, Colossal magnetoresistance in the double perovskite oxide $\text{La}_2\text{CoMnO}_6$, *J. Appl. Phys.* 107 (2010) 1–4.
<https://doi.org/10.1063/1.3350907>.
- [83] P. Lunkenheimer, S. Krohns, S. Riegg, S.G. Ebbinghaus, A. Reller, A. Loidl, Colossal dielectric constants in transition-metal oxides, *Eur. Phys. J. Spec. Top.* 180 (2009) 61–89. <https://doi.org/10.1140/epjst/e2010-01212-5>.
- [84] S. Lafuerza, J. García, G. Subías, J. Blasco, K. Conder, E. Pomjakushina, Intrinsic electrical properties of LuFe_2O_4 , *Phys. Rev. B - Condens. Matter Mater. Phys.* 88 (2013) 1–7. <https://doi.org/10.1103/PhysRevB.88.085130>.
- [85] P. Lunkenheimer, R. Fichtl, S.G. Ebbinghaus, A. Loidl, Nonintrinsic origin of the colossal dielectric constants in $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$, *Phys. Rev. B - Condens. Matter Mater. Phys.* 70 (2004) 1–4. <https://doi.org/10.1103/PhysRevB.70.172102>.
- [86] P. Singh, M. Alam, S. Kumar, K. Anand, V.K. Gangwar, S. Ghosh, M. Sawada, K. Shimada, R.K. Singh, A.K. Ghosh, S. Chatterjee, Roles of Re-entrant cluster glass state and spin-lattice coupling in magneto-dielectric behavior of giant dielectric double perovskite $\text{La}_{1.8}\text{Pr}_{0.2}\text{CoFeO}_6$, *J. Phys. Condens. Matter* 32 (2020).
<https://doi.org/10.1088/1361-648X/aba778>.
- [87] S. Yáñez-Vilar, M. Sánchez-Andújar, J. Rivas, M.A. Señarís-Rodríguez, Influence of the cationic ordering in the dielectric properties of the $\text{La}_2\text{MnCoO}_6$ perovskite, *J.*

Alloys Compd. 485 (2009) 82–87. <https://doi.org/10.1016/j.jallcom.2009.05.103>.

- [88] J. Liu, C.G. Duan, W.G. Yin, W.N. Mei, R.W. Smith, J.R. Hardy, Large dielectric constant and Maxwell-Wagner relaxation in $\text{Bi}_{2/3}\text{Cu}_3\text{Ti}_4\text{O}_{12}$, *Phys. Rev. B - Condens. Matter Mater. Phys.* 70 (2004) 1–7. <https://doi.org/10.1103/PhysRevB.70.144106>.
- [89] H. Rahmouni, M. Smari, B. Cherif, E. Dhahri, K. Khirouni, Conduction mechanism, impedance spectroscopic investigation and dielectric behavior of $\text{La}_{0.5}\text{Ca}_{0.5-x}\text{Ag}_x\text{MnO}_3$ manganites with compositions below the concentration limit of silver solubility in perovskites ($0 \leq x \leq 0.2$), *Dalt. Trans.* 44 (2015) 10457–10466. <https://doi.org/10.1039/c5dt00444f>.
- [90] M. Alam, L. Ghosh, S. Majumder, P. Singh, S.V. Kumar, S. Dixit, D. Kumar, K. Anand, S. Kumari, A.K. Ghosh, R.J. Choudhary, S. Chatterjee, Multifunctional behavior in B-site disordered double perovskite EuPrCoMnO_6 , *J. Phys. D: Appl. Phys.* 55 (2022). <https://doi.org/10.1088/1361-6463/ac5fd4>.
- [91] S. Pal, Sharada Govinda, M. Goyal, S. Mukherjee, B. Pal, R. Saha, A. Sundaresan, S. Jana, O. Karis, J.W. Freeland, D.D. Sarma, Effect of anti-site disorder on magnetism in $\text{La}_2\text{NiMnO}_6$, *Phys. Rev. B* 97 (2018) 1–7. <https://doi.org/10.1103/PhysRevB.97.165137>.
- [92] J. Wang, J.B. Neaton, H. Zheng, V. Nagarajan, S.B. Ogale, B. Liu, D. Viehland, V. Vaithyanathan, D.G. Schlom, U. V. Waghmare, N.A. Spaldin, K.M. Rabe, M. Wuttig, R. Ramesh, Epitaxial BiFeO_3 multiferroic thin film heterostructures, *Science* (80-.). 299 (2003) 1719–1722. <https://doi.org/10.1126/science.1080615>.

- [93] Y. Chang, K. Zhai, Y. Sun, Magnetoelectric effects in multiferroic Y-type hexaferrites $\text{Ba}_{0.3}\text{Sr}_{1.7}\text{Co}_x\text{Mg}_{2-x}\text{Fe}_{12}\text{O}_{22}$, *Chinese Phys. B* 29 (2020) 1–5. <https://doi.org/10.1088/1674-1056/ab696c>.
- [94] F.S. Galasso, *Properties and Perovskite-Type*, (1969) 1–207.
- [95] A. Pal, P. Singh, V.K. Gangwar, A.G. Joshi, P. Khuntia, G.D. Dwivedi, P.K. Gupta, M. Alam, K. Anand, K. Sethupathi, A.K. Ghosh, S. Chatterjee, Probing the Griffiths like phase, unconventional dual glassy states, giant exchange bias effects and its correlation with its electronic structure in $\text{Pr}_{2-x}\text{Sr}_x\text{CoMnO}_6$, *J. Phys. Condens. Matter* 32 (2020). <https://doi.org/10.1088/1361-648X/ab5326>.
- [96] Y. Guo, L. Shi, S. Zhou, J. Zhao, W. Liu, Near room-temperature magnetoresistance effect in double perovskite $\text{La}_2\text{NiMnO}_6$, *Appl. Phys. Lett.* 102 (2013). <https://doi.org/10.1063/1.4808437>.
- [97] H.S. Nair, R. Pradheesh, Y. Xiao, D. Cherian, S. Elizabeth, T. Hansen, T. Chatterji, T. Brückel, Magnetization-steps in Y_2CoMnO_6 double perovskite: The role of antisite disorder, *J. Appl. Phys.* 116 (2014). <https://doi.org/10.1063/1.4896399>.
- [98] An overview of the structural correlation of magnetic and electrical properties of $\text{Pr}_2\text{NiMnO}_6$ Double perovskite, 6 (n.d.) 1–45.
- [99] R. Rajesh Kumar, J. Krishnamurthy, J. Arout Chelvane, A. Venimadhav, Spontaneous magnetization reversal and positive exchange bias effect in $\text{CoFeSiB}/\text{FeCrO}_3$ heterostructures, *J. Phys. D: Appl. Phys.* 54 (2021). <https://doi.org/10.1088/1361-6463/ac1e4b>.

- [100] D. Choudhury, P. Mandal, R. Mathieu, A. Hazarika, S. Rajan, A. Sundaresan, U. V. Waghmare, R. Knut, O. Karis, P. Nordblad, D.D. Sarma, Magnetic, dielectric and magneto-dielectric behavior of half-doped LaSrCoMnO₆, *Phys. Rev. Lett.* 108 (2012) 1–5. <https://doi.org/10.1103/PhysRevLett.108.127201>.
- [101] C. Bharti, N. Bhadra, A. Sen, S. Chanda, T.P. Sinha, Cationic ordering and Dielectric Relaxation in a New Series of Double Perovskite BaNdCoXO₆ (X = Nb, Sb and Ta), *Mater. Today Proc.* 2 (2015) 1257–1259. <https://doi.org/10.1016/j.matpr.2015.07.040>.
- [102] J. Blasco, J. García, G. Subías, J. Stankiewicz, J.A. Rodríguez-Velamazán, C. Ritter, J.L. García-Muñoz, F. Fauth, Magnetolectric and structural properties of Y₂CoMnO₆: The role of antisite defects, *Phys. Rev. B* 93 (2016) 1–12. <https://doi.org/10.1103/PhysRevB.93.214401>.
- [103] M. García-Hernández, J.L. Martínez, M.J. Martínez-Lope, M.T. Casais, J.A. Alonso, Finding universal correlations between cationic disorder and low field magnetoresistance in FeMo double perovskite series, *Phys. Rev. Lett.* 86 (2001) 2443–2446. <https://doi.org/10.1103/PhysRevLett.86.2443>.
- [104] M.P. Singh, K.D. Truong, S. Jandl, P. Fournier, Multiferroic double perovskites: Opportunities, issues, and challenges, *J. Appl. Phys.* 107 (2010) 09D917. <https://doi.org/10.1063/1.3362922>.
- [105] J.C. Walling, R.L. White, Study of magnetic interactions in HoFeO₃, *Phys. Rev. B* 10 (1974) 4748–4759. <https://doi.org/10.1103/PhysRevB.10.4748>.
- [106] J. Hemberger, S. Lobina, H.A. Krug Von Nidda, N. Tristan, V.Y. Ivanov, A.A.

- Mukhin, A.M. Balbashov, A. Loidl, Complex interplay of 3d and 4f magnetism in $\text{La}_{1-x}\text{Gd}_x\text{MnO}_3$, *Phys. Rev. B - Condens. Matter Mater. Phys.* 70 (2004) 1–8. <https://doi.org/10.1103/PhysRevB.70.024414>.
- [107] G. Muscas, K. Prabakar, F. Congiu, G. Datt, T. Sarkar, Nanostructure-driven complex magnetic behavior of $\text{Sm}_2\text{CoMnO}_6$ double perovskite, *J. Alloys Compd.* 906 (2022). <https://doi.org/10.1016/j.jallcom.2022.164385>.
- [108] H. Wu, S. Cao, M. Liu, Y. Cao, B. Kang, J. Zhang, W. Ren, Twofold spin reorientation and field-induced incomplete phase transition in single-crystal $\text{Dy}_{0.5}\text{Pr}_{0.5}\text{FeO}_3$, *Phys. Rev. B - Condens. Matter Mater. Phys.* 90 (2014) 1–5. <https://doi.org/10.1103/PhysRevB.90.144415>.
- [109] A.A. Khan, A. Ahlawat, A. Sharma, P. Deshmukh, M.N. Singh, A. Sagdeo, V. Sathe, A.K. Karnal, S. Satapathy, Spin reorientation transition and coupled spin-lattice dynamics of $\text{Sm}_{0.6}\text{Dy}_{0.4}\text{FeO}_3$, *J. Phys. Condens. Matter* 32 (2020). <https://doi.org/10.1088/1361-648X/ab9d4e>.
- [110] A. V. Kimel, A. Kirilyuk, F. Hansteen, R. V. Pisarev, T. Rasing, Nonthermal optical control of magnetism and ultrafast laser-induced spin dynamics in solids, *J. Phys. Condens. Matter* 19 (2007). <https://doi.org/10.1088/0953-8984/19/4/043201>.
- [111] J. Knolle, G.W. Chern, D.L. Kovrizhin, R. Moessner, N.B. Perkins, Raman scattering signatures of Kitaev spin liquids in A_2IrO_3 iridates with $\text{A}=\text{Na}$ or Li , *Phys. Rev. Lett.* 113 (2014) 1–5. <https://doi.org/10.1103/PhysRevLett.113.187201>.
- [112] A. Ito, H. Aruga, E. Torikai, M. Kikuchi, Y. Syono, H. Takei, Time-dependent

- phenomena in a short-range Ising spin-glass, $\text{Fe}_{0.5}\text{Mn}_{0.5}\text{TiO}_3$, *Phys. Rev. Lett.* 57 (1986) 483–486. <https://doi.org/10.1103/PhysRevLett.57.483>.
- [113] J. Nogués, J. Sort, V. Langlais, V. Skumryev, S. Suriñach, J.S. Muñoz, M.D. Baró, Exchange bias in nanostructures, *Phys. Rep.* 422 (2005) 65–117. <https://doi.org/10.1016/j.physrep.2005.08.004>.
- [114] I. Jepu, C. Porosnicu, C.P. Lungu, I. Mustata, C. Luculescu, V. Kuncser, G. Iacobescu, A. Marin, V. Ciupina, Combinatorial Fe-Co thin film magnetic structures obtained by thermionic vacuum arc method, *Surf. Coatings Technol.* 240 (2014) 344–352. <https://doi.org/10.1016/j.surfcoat.2013.12.050>.
- [115] X. Li, K.W. Lin, H.T. Liang, P.L. Liu, W.C. Lo, D.L. Cortie, F. Klose, J. Van Lierop, L. Li, P.W.T. Pong, The effects of post-deposition ion-beam bombardment with oxygen on the Co surface in modifying the magnetic properties of Co thin films, *Microelectron. Eng.* 152 (2016) 41–47. <https://doi.org/10.1016/j.mee.2015.12.019>.
- [116] E.L. Fertman, A. V. Fedorchenko, V.A. Desnenko, V. V. Shvartsman, D.C. Lupascu, S. Salamon, H. Wende, A.I. Vaisburd, A. Stanulis, R. Ramanauskas, N.M. Olekhovich, A. V. Pushkarev, Y. V. Radyush, D.D. Khalyavin, A.N. Salak, Exchange bias effect in bulk multiferroic $\text{BiFe}_{0.5}\text{Sc}_{0.5}\text{O}_3$, *AIP Adv.* 10 (2020) 0–5. <https://doi.org/10.1063/1.5135586>.
- [117] G. Popov, M. Greenblatt, M. Croft, Large effects of A-site average cation size on the properties of the double perovskites (formula presented) A (formula presented) system, *Phys. Rev. B - Condens. Matter Mater. Phys.* 67 (2003) 1–9. <https://doi.org/10.1103/PhysRevB.67.024406>.

- [118] D. V Karpinsky, I.O. Troyanchuk, K. Bärner, H. Szymczak, M. Tovar, Crystal structure and magnetic ordering of the $\text{LaCo}_{1-x}\text{Fe}_x\text{O}_3$ system, *J. Phys. Condens. Matter* 17 (2005) 7219. <https://doi.org/10.1088/0953-8984/17/46/006>.
- [119] G.R. Haripriya, C.M.N. Kumar, R. Pradheesh, L.M. Martinez, C.L. Saiz, S.R. Singamaneni, T. Chatterji, V. Sankaranarayanan, K. Sethupathi, B. Kiefer, H.S. Nair, Contrasting the magnetism in $\text{La}_{1-x}\text{Sr}_x\text{FeCoO}_{6+\delta}$ ($x=0, 1, 2$) double perovskites: The role of electronic and cationic disorder, *Phys. Rev. B* 99 (2019) 184411. <https://doi.org/10.1103/PhysRevB.99.184411>.
- [120] K. Anand, A. Pal, A.G. Joshi, P. Pal, R. Singh, Giant exchange bias in antiferromagnetic $\text{Pr}_2\text{CoFe}_{0.5}\text{Mn}_{0.5}\text{O}_6$: a, (n.d.).
- [121] S. Mickevičius, S. Grebinskij, V. Bondarenka, B. Vengalis, K. Šliuziene, B.A. Orłowski, V. Osinniy, W. Drube, Investigation of epitaxial LaNiO_{3-x} thin films by high-energy XPS, *J. Alloys Compd.* 423 (2006) 107–111. <https://doi.org/10.1016/j.jallcom.2005.12.038>.
- [122] D.A. Pawlak, K. Woźniak, Z. Frukacz, T.L. Barr, D. Fiorentino, S. Seal, ESCA studies of yttrium aluminum garnets, *J. Phys. Chem. B* 103 (1999) 1454–1461. <https://doi.org/10.1021/jp9838801>.
- [123] C.A.F. Vaz, D. Prabhakaran, E.I. Altman, V.E. Henrich, Experimental study of the interfacial cobalt oxide in $\text{Co}_3\text{O}_4/\alpha\text{-Al}_2\text{O}_3$ (0001) epitaxial films, *Phys. Rev. B - Condens. Matter Mater. Phys.* 80 (2009) 1–7. <https://doi.org/10.1103/PhysRevB.80.155457>.

- [124] A. Pal, S. Ghosh, A.G. Joshi, S. Kumar, S. Patil, P.K. Gupta, P. Singh, V.K. Gangwar, P. Prakash, R.K. Singh, E.F. Schwier, M. Sawada, K. Shimada, A.K. Ghosh, A. Das, S. Chatterjee, Investigation of multi-mode spin-phonon coupling and local B-site disorder in Pr₂CoFeO₆ by Raman spectroscopy and correlation with its electronic structure by XPS and XAS studies, *J. Phys. Condens. Matter* 31 (2019). <https://doi.org/10.1088/1361-648X/ab144f>.
- [125] S. Laureti, E. Agostinelli, G. Scavia, G. Varvaro, V.R. Albertini, A. Generosi, B. Paci, A. Mezzi, S. Kaciulis, Effect of oxygen partial pressure on PLD cobalt oxide films, *Appl. Surf. Sci.* 254 (2008) 5111–5115. <https://doi.org/10.1016/j.apsusc.2008.02.055>.
- [126] M. Ghaffari, M. Shannon, H. Hui, O.K. Tan, A. Irannejad, Preparation, surface state and band structure studies of SrTi_{1-x}Fe_xO_{3-δ} (x = 0-1) perovskite-type nano structure by X-ray and ultraviolet photoelectron spectroscopy, *Surf. Sci.* 606 (2012) 670–677. <https://doi.org/10.1016/j.susc.2011.12.013>.
- [127] F. Jin, Y. Shen, R. Wang, T. He, Double-perovskite PrBaCo_{2/3}Fe_{2/3}Cu_{2/3}O_{5+δ} as cathode material for intermediate-temperature solid-oxide fuel cells, *J. Power Sources* 234 (2013) 244–251. <https://doi.org/10.1016/j.jpowsour.2013.01.172>.
- [128] H. Falcón, J.A. Barbero, G. Araujo, M.T. Casais, M.J. Martínez-Lope, J.A. Alonso, J.L.G. Fierro, Double perovskite oxides A₂FeMoO_{6-δ} (A=Ca, Sr and Ba) as catalysts for methane combustion, *Appl. Catal. B Environ.* 53 (2004) 37–45. <https://doi.org/https://doi.org/10.1016/j.apcatb.2004.05.004>.
- [129] R.C. Sahoo, D. Paladhi, P. Dasgupta, A. Poddar, R. Singh, A. Das, T.K. Nath, Antisite-disorder driven large exchange bias effect in phase-separated

- La_{1.5}Ca_{0.5}CoMnO₆ double perovskite, *J. Magn. Mater.* 428 (2017) 86–91.
<https://doi.org/10.1016/j.jmmm.2016.12.018>.
- [130] F. Guillou, Q. Zhang, Z. Hu, C.Y. Kuo, Y.Y. Chin, H.J. Lin, C.T. Chen, A. Tanaka, L.H. Tjeng, V. Hardy, Coupled valence and spin state transition in (Pr_{0.7}Sm_{0.3})_{0.7}Ca_{0.3}CoO₃, *Phys. Rev. B - Condens. Matter Mater. Phys.* 87 (2013) 1–9.
<https://doi.org/10.1103/PhysRevB.87.115114>.
- [131] M.W. Haverkort, Z. Hu, J.C. Cezar, T. Burnus, H. Hartmann, M. Reuther, C. Zobel, T. Lorenz, A. Tanaka, N.B. Brookes, H.H. Hsieh, H.J. Lin, C.T. Chen, L.H. Tjeng, Spin state transition in LaCoO₃ studied using soft X-ray absorption spectroscopy and magnetic circular dichroism, *Phys. Rev. Lett.* 97 (2006) 38–41.
<https://doi.org/10.1103/PhysRevLett.97.176405>.
- [132] A. Arrott, Criterion for ferromagnetism from observations of magnetic isotherms, *Phys. Rev.* 108 (1957) 1394–1396. <https://doi.org/10.1103/PhysRev.108.1394>.
- [133] J. Souletie, J.L. Tholence, Critical slowing down in spin glasses and other glasses: Fulcher versus power law, *Phys. Rev. B* 32 (1985) 516–519.
<https://doi.org/10.1103/PhysRevB.32.516>.
- [134] A. Pal, P. Singh, V.K. Gangwar, A.G. Joshi, P. Khuntia, G.D. Dwivedi, P.K. Gupta, M. Alam, K. Anand, K. Sethupathi, A.K. Ghosh, S. Chatterjee, Probing the Griffiths like phase, unconventional dual glassy states, giant exchange bias effects and its correlation with its electronic structure in Pr_{2-x}Sr_xCoMnO₆, *J. Phys. Condens. Matter* 32 (2020). <https://doi.org/10.1088/1361-648X/ab5326>.

- [135] S. Ghorai, S.A. Ivanov, R. Skini, P. Svedlindh, Evolution of Griffiths phase and critical behavior of $\text{La}_{1-x}\text{Pb}_x\text{MnO}_{3\pm y}$ solid solutions, *J. Phys. Condens. Matter* 33 (2021) 145801. <https://doi.org/10.1088/1361-648X/abdd64>.
- [136] J.A. Mydosh, Disordered magnetism and spin glasses, *J. Magn. Mater.* 157–158 (1996) 606–610. [https://doi.org/10.1016/0304-8853\(95\)01272-9](https://doi.org/10.1016/0304-8853(95)01272-9).
- [137] P.K. Gupta, S. Ghosh, S. Kumari, A. Pal, S. Roy, R. Singh, P. Singh, R.K. Singh, A.K. Ghosh, S. Chatterjee, Spin phonon coupling and magneto-dielectric coupling in $\text{BiFeO}_3\text{-TbMnO}_3$ composite, *Mater. Res. Express* 6 (2019). <https://doi.org/10.1088/2053-1591/ab2742>.
- [138] I. Errea, Superconducting hydrides on a quantum landscape, *J. Phys. Condens. Matter* 34 (2022). <https://doi.org/10.1088/1361-648X/ac5b46>.
- [139] I. Bakaimi, R. Brescia, C.M. Brown, A.A. Tsirlin, M.A. Green, A. Lappas, Hydration-induced spin-glass state in a frustrated Na-Mn-O triangular lattice, *Phys. Rev. B* 93 (2016). <https://doi.org/10.1103/PhysRevB.93.184422>.
- [140] J. Dho, W.S. Kim, N.H. Hur, Reentrant Spin Glass Behavior in Cr-Doped Perovskite Manganite, *Phys. Rev. Lett.* 89 (2002) 1–4. <https://doi.org/10.1103/PhysRevLett.89.027202>.
- [141] S. Ghara, B.-G. Jeon, K. Yoo, K.H. Kim, A. Sundaresan, Reentrant spin-glass state and magnetodielectric effect in the spiral magnet $\text{BiMnFe}_2\text{O}_6$, *Phys. Rev. B* 90 (2014) 24413. <https://doi.org/10.1103/PhysRevB.90.024413>.

- [142] K. Yadav, M.K. Sharma, S. Singh, K. Mukherjee, Exotic magnetic behavior and evidence of cluster glass and Griffiths-like phase in Heusler alloys $\text{Fe}_{2-x}\text{Mn}_x\text{CrAl}$ ($0 \leq x \leq 1$), *Sci. Rep.* 9 (2019) 1–16. <https://doi.org/10.1038/s41598-019-52452-7>.
- [143] G.R. Haripriya, H.S. Nair, R. Pradheesh, S. Rayaprol, V. Siruguri, D. Singh, R. Venkatesh, V. Ganesan, K. Sethupathi, V. Sankaranarayanan, Spin reorientation and disordered rare earth magnetism in $\text{Ho}_2\text{FeCoO}_6$, *J. Phys. Condens. Matter* 29 (2017). <https://doi.org/10.1088/1361-648X/aa919e>.
- [144] R.N. Kini, A.J. Kent, M. Henini, Phonon-assisted tunneling in a superlattice in an applied magnetic field, *Phys. Rev. B - Condens. Matter Mater. Phys.* 80 (2009) 2–6. <https://doi.org/10.1103/PhysRevB.80.035335>.
- [145] H. Wu, S. Cao, M. Liu, Y. Cao, B. Kang, J. Zhang, W. Ren, Twofold spin reorientation and field-induced incomplete phase transition in single-crystal $\text{Dy}_{0.5}\text{Pr}_{0.5}\text{FeO}_3$, *Phys. Rev. B* 90 (2014) 144415. <https://doi.org/10.1103/PhysRevB.90.144415>.
- [146] J. Ahmad, G. Zakia, H. Abbas, S.H. Bukhari, U. Nissar, M.T. Jamil, J.A. Khan, U. Ahmad, S.A. Ali, T. Sultan, Lattice and structural distortions in Gd^{3+} substituted LaMnO_3 : Infrared reflectivity measurements, *J. Ovonic Res.* 15 (2019) 345–355.
- [147] Volume 25 Issue 3 Article No 23301 1-9 pages, 25 (2023). <https://doi.org/10.26907/mrsej>.
- [148] J. Krishna Murthy, K.D. Chandrasekhar, H.C. Wu, H.D. Yang, J.Y. Lin, A. Venimadhav, Antisite disorder driven spontaneous exchange bias effect in La_2 -

- $x\text{Sr}_x\text{CoMnO}_6$ ($0 \leq x \leq 1$), *J. Phys. Condens. Matter* 28 (2016).
<https://doi.org/10.1088/0953-8984/28/8/086003>.
- [149] A. Harres, M. Mikhov, V. Skumryev, A.M.H. De Andrade, J.E. Schmidt, J. Geshev, Criteria for saturated magnetization loop, *J. Magn. Magn. Mater.* 402 (2016) 76–82.
<https://doi.org/10.1016/j.jmmm.2015.11.046>.
- [150] A. Banerjee, J. Sannigrahi, S. Giri, S. Majumdar, Magnetization reversal and inverse exchange bias phenomenon in the ferrimagnetic polycrystalline compound $\text{Er}_2\text{CoMnO}_6$, *Phys. Rev. B* 98 (2018) 1–8.
<https://doi.org/10.1103/PhysRevB.98.104414>.
- [151] D. Niebieskikwiat, M.B. Salamon, Intrinsic interface exchange coupling of ferromagnetic nanodomains in a charge-ordered manganite, *Phys. Rev. B - Condens. Matter Mater. Phys.* 72 (2005) 1–6. <https://doi.org/10.1103/PhysRevB.72.174422>.
- [152] K.D. Truong, M.P. Singh, S. Jandl, P. Fournier, Influence of Ni/Mn cation order on the spin-phonon coupling in multifunctional $\text{La}_2\text{NiMnO}_6$ epitaxial films by polarized Raman spectroscopy, *Phys. Rev. B* 80 (2009) 134424.
<https://doi.org/10.1103/PhysRevB.80.134424>.
- [153] M.P. Singh, K.D. Truong, S. Jandl, P. Fournier, Long-range Ni/Mn structural order in epitaxial double perovskite $\text{La}_2\text{NiMnO}_6$ thin films, *Phys. Rev. B* 79 (2009) 224421. <https://doi.org/10.1103/PhysRevB.79.224421>.
- [154] E. Granado, A. García, J.A. Sanjurjo, C. Rettori, I. Torriani, F. Prado, R.D. Sánchez, A. Caneiro, S.B. Oseroff, Magnetic ordering effects in the Raman spectra of La_{1-x}

- xMn_{1-x}O₃, Phys. Rev. B - Condens. Matter Mater. Phys. 60 (1999) 11879–11882.
<https://doi.org/10.1103/physrevb.60.11879>.
- [155] M.C. Weber, M. Guennou, H.J. Zhao, J. Íñiguez, R. Vilarinho, A. Almeida, J.A. Moreira, J. Kreisel, Raman spectroscopy of rare-earth orthoferrites $\text{R}\{\text{FeO}\}_3$ ($\text{R}=\text{La, Sm, Eu, Gd, Tb, Dy}$), Phys. Rev. B 94 (2016) 214103. <https://doi.org/10.1103/PhysRevB.94.214103>.
- [156] H. Khalil, H.S. Nair, H.L. Bhat, S. Elizabeth, Glassy dielectric response in Tb₂NiMnO₆ double perovskite with similarities to a Griffiths phase, Epl 104 (2013). <https://doi.org/10.1209/0295-5075/104/67002>.
- [157] J. Laverdière, S. Jandl, A.A. Mukhin, V.Y. Ivanov, V.G. Ivanov, M.N. Iliev, Spin-phonon coupling in orthorhombic $\text{R}\{\text{Mn}\}\{\text{O}\}_3$ ($\text{R}=\text{Pr}, \text{Nd}, \text{Sm}, \text{Eu}, \text{Gd}, \text{Tb}, \text{Dy}, \text{Ho}, \text{Y}$): A Raman study, Phys. Rev. B 73 (2006) 214301. <https://doi.org/10.1103/PhysRevB.73.214301>.
- [158] R. Mohassel, A. Sobhani, M. Salavati-Niasari, M. Goudarzi, Pechini synthesis and characteristics of Gd₂CoMnO₆ nanostructures and its structural, optical and photocatalytic properties, Spectrochim. Acta - Part A Mol. Biomol. Spectrosc. 204 (2018) 232–240. <https://doi.org/10.1016/j.saa.2018.06.050>.
- [159] M. Balkanski, R.F. Wallis, E. Haro, Anharmonic effects in light scattering due to optical phonons in silicon, Phys. Rev. B 28 (1983) 1928–1934. <https://doi.org/10.1103/PhysRevB.28.1928>.

- [160] V. Srinu Bhadram, B. Rajeswaran, A. Sundaresan, C. Narayana, Spin-phonon coupling in multiferroic RCrO₃ (R-Y, Lu, Gd, Eu, Sm): A Raman study, *Epl* 101 (2013). <https://doi.org/10.1209/0295-5075/101/17008>.
- [161] A. Nonato, B.S. Araujo, A.P. Ayala, A.P. Maciel, S. Yanez-Vilar, M. Sanchez-Andujar, M.A. Senaris-Rodriguez, C.W.A. Paschoal, Spin-phonon and magnetostriction phenomena in CaMn₇O₁₂ helimagnet probed by Raman spectroscopy, *Appl. Phys. Lett.* 105 (2014) 1–5. <https://doi.org/10.1063/1.4902234>.
- [162] R. Gupta, A.K. Sood, P. Metcalf, J.M. Honig, Raman study of stoichiometric and Zn-doped Fe₃O₄, *Phys. Rev. B - Condens. Matter Mater. Phys.* 65 (2002) 1044301–1044308. <https://doi.org/10.1103/PhysRevB.65.104430>.
- [163] P.K. Pandey, R.J. Choudhary, D.K. Mishra, V.G. Sathe, D.M. Phase, Signature of spin-phonon coupling in Sr₂CoO₄ thin film: A Raman spectroscopic study, *Appl. Phys. Lett.* 102 (2013) 142401. <https://doi.org/10.1063/1.4800442>.
- [164] R. Rawat, R.J. Choudhary, A.M. Awasthi, R. Raghunathan, A. Sagdeo, A.K. Sinha, S. Chaudhary, S. Patnaik, D.M. Phase, Magneto-dielectric coupling and non-ergodic electrical behavior in hexagonal Sr_{0.6}Ba_{0.4}MnO₃ via local strain driven magnetic ordering, *J. Magn. Mater.* 497 (2020) 165972. <https://doi.org/10.1016/j.jmmm.2019.165972>.
- [165] H.Z. Guo, A. Gupta, T.G. Calvarese, M.A. Subramanian, Structural and magnetic properties of epitaxial thin films of the ordered double perovskite La₂CoMnO₆, *Appl. Phys. Lett.* 89 (2006) 262503. <https://doi.org/10.1063/1.2422878>.

- [166] S. Baidya, T. Saha-Dasgupta, Electronic structure and phonons in $\text{La}_2\text{CoMnO}_6$: A ferromagnetic insulator driven by Coulomb-assisted spin-orbit coupling, *Phys. Rev. B - Condens. Matter Mater. Phys.* 84 (2011) 1–5. <https://doi.org/10.1103/PhysRevB.84.035131>.
- [167] K.D. Chandrasekhar, A.K. Das, C. Mitra, A. Venimadhav, The extrinsic origin of the magnetodielectric effect in the double perovskite $\text{La}_2\text{NiMnO}_6$, *J. Phys. Condens. Matter* 24 (2012). <https://doi.org/10.1088/0953-8984/24/49/495901>.
- [168] R.C. Sahoo, S.K. Giri, D. Paladhi, A. Das, T.K. Nath, Evidence of cluster-glass-like state at low temperature in anti-site disordered $\text{La}_{1.5}\text{Ca}_{0.5}\text{CoMnO}_6$ double perovskite, *J. Appl. Phys.* 120 (2016) 0–7. <https://doi.org/10.1063/1.4958980>.
- [169] R.C. Sahoo, D. Paladhi, P. Dasgupta, A. Poddar, R. Singh, A. Das, T.K. Nath, Antisite-disorder driven large exchange bias effect in phase-separated $\text{La}_{1.5}\text{Ca}_{0.5}\text{CoMnO}_6$ double perovskite, *J. Magn. Mater.* 428 (2017) 86–91. <https://doi.org/10.1016/j.jmmm.2016.12.018>.
- [170] S. Vasala, M. Karppinen, $\text{A}_2\text{B}'\text{B}''\text{O}_6$ perovskites: A review, *Prog. Solid State Chem.* 43 (2015) 1–36. <https://doi.org/10.1016/j.progsolidstchem.2014.08.001>.
- [171] G. Sharma, J. Saha, S.D. Kaushik, V. Siruguri, S. Patnaik, Magnetism is driven ferroelectricity above liquid nitrogen temperature in Y_2CoMnO_6 , *Appl. Phys. Lett.* 103 (2013) 2–6. <https://doi.org/10.1063/1.4812728>.
- [172] M.G. Masud, A. Ghosh, J. Sannigrahi, B.K. Chaudhuri, Observation of relaxor ferroelectricity and multiferroic behavior in nanoparticles of the ferromagnetic

- semiconductor $\text{La}_{2}\text{NiMnO}_{6}$, *J. Phys. Condens. Matter* 24 (2012).
<https://doi.org/10.1088/0953-8984/24/29/295902>.
- [173] Q. Sun, Z. Wang, M. Zhou, J. Li, R. Lu, Y. Wang, X. Liao, Y. Zhao, T. Avenue, *Pr ep rin ot pe er re v Pr ep rin ot pe er ed*, (2023) 1–8.
- [174] S. Kumar, G. Giovannetti, J. Van Den Brink, S. Picozzi, Theoretical prediction of multiferroicity in double perovskite $\text{Y}_{2}\text{NiMnO}_{6}$, *Phys. Rev. B - Condens. Matter Mater. Phys.* 82 (2010) 1–6. <https://doi.org/10.1103/PhysRevB.82.134429>.
- [175] S. Picozzi, K. Yamauchi, I.A. Sergienko, C. Sen, B. Sanyal, E. Dagotto, Microscopic mechanisms for improper ferroelectricity in multiferroic perovskites: A theoretical review, *J. Phys. Condens. Matter* 20 (2008). <https://doi.org/10.1088/0953-8984/20/43/434208>.
- [176] J. Hemberger, F. Schrettle, A. Pimenov, P. Lunkenheimer, V.Y. Ivanov, A.A. Mukhin, A.M. Balbashov, A. Loidl, Multiferroic phases of $\text{Eu}_{1-x}\text{Y}_{x}\text{MnO}_{3}$, *Phys. Rev. B - Condens. Matter Mater. Phys.* 75 (2007) 1–8. <https://doi.org/10.1103/PhysRevB.75.035118>.
- [177] M. Tokunaga, Y. Yamasaki, Y. Onose, M. Mochizuki, N. Furukawa, Y. Tokura, Novel Multiferroic State of $\text{Eu}_{1-x}\text{Y}_{x}\text{MnO}_{3}$ in High Magnetic Fields, *Phys. Rev. Lett.* 103 (2009) 3–6. <https://doi.org/10.1103/PhysRevLett.103.187202>.
- [178] T. Runčevski, C.M. Brown, The Rietveld Refinement Method: Half of a Century Anniversary, *Cryst. Growth Des.* 21 (2021) 4821–4822. <https://doi.org/10.1021/acs.cgd.1c00854>.

- [179] A. El Yacoubi, A. Massit, S. El Moutaoikel, A. Rezzouk, B. Chafik El Idrissi, Rietveld Refinement of the Crystal Structure of Hydroxyapatite Using X-ray Powder Diffraction, *Am. J. Mater. Sci. Eng.* 5 (2017) 1–5. <https://doi.org/10.12691/ajmse-5-1-1>.
- [180] C.D. Wagner, NIST X-ray Photoelectron Spectrometry Database, NIST Stand. Ref. Database 20, Version 4.1 (1991) 1–76. <http://srdata.nist.gov/xps/Default.aspx>.
- [181] Q. Liu, J. Li, Z. Zhou, J. Xie, J.Y. Lee, Hydrophilic Mineral Coating of Membrane Substrate for Reducing Internal Concentration Polarization (ICP) in Forward Osmosis, *Sci. Rep.* 6 (2016) 1–10. <https://doi.org/10.1038/srep19593>.
- [182] W.T. Koo, S.J. Choi, J.S. Jang, I.D. Kim, Metal-organic framework templated synthesis of ultrasmall catalyst loaded ZnO/ZnCo₂O₄ hollow spheres for enhanced gas sensing Properties, *Sci. Rep.* 7 (2017) 1–10. <https://doi.org/10.1038/srep45074>.
- [183] L. Wei, F. Hu, Z. Chen, Y. Shen, L. Zhang, W. Min, Live-Cell Bioorthogonal Chemical Imaging: Stimulated Raman Scattering Microscopy of Vibrational Probes, *Acc. Chem. Res.* 49 (2016) 1494–1502. <https://doi.org/10.1021/acs.accounts.6b00210>.
- [184] E. Ríos, S. Abarca, P. Daccarett, H. Nguyen Cong, D. Martel, J.F. Marco, J.R. Gancedo, J.L. Gautier, Electrocatalysis of oxygen reduction on Cu_xMn_{3-x}O₄ (1.0 ≤ x ≤ 1.4) spinel particles/polypyrrole composite electrodes, *Int. J. Hydrogen Energy* 33 (2008) 4945–4954. <https://doi.org/10.1016/j.ijhydene.2008.06.030>.
- [185] A. Moses Ezhil Raj, S.G. Victoria, V.B. Jothy, C. Ravidhas, J. Wollschläger, M. Suendorf, M. Neumann, M. Jayachandran, C. Sanjeeviraja, XRD and XPS

- characterization of mixed valence Mn₃O₄ hausmannite thin films prepared by chemical spray pyrolysis technique, *Appl. Surf. Sci.* 256 (2010) 2920–2926. <https://doi.org/10.1016/j.apsusc.2009.11.051>.
- [186] M.C. Biesinger, B.P. Payne, A.P. Grosvenor, L.W.M. Lau, A.R. Gerson, R.S.C. Smart, Resolving surface chemical states in XPS analysis of first-row transition metals, oxides and hydroxides: Cr, Mn, Fe, Co and Ni, *Appl. Surf. Sci.* 257 (2011) 2717–2730. <https://doi.org/10.1016/j.apsusc.2010.10.051>.
- [187] E.S. Ilton, J.E. Post, P.J. Heaney, F.T. Ling, S.N. Kerisit, XPS determination of Mn oxidation states in Mn (hydro)oxides, *Appl. Surf. Sci.* 366 (2016) 475–485. <https://doi.org/10.1016/j.apsusc.2015.12.159>.
- [188] G.U. Kulkarni, C.P. Vinod, Diverse reactivity patterns observed in the interaction of oxygen with nickel deposited on gold and tungsten surfaces, *Appl. Surf. Sci.* 115 (1997) 336–341. [https://doi.org/10.1016/S0169-4332\(97\)00009-3](https://doi.org/10.1016/S0169-4332(97)00009-3).
- [189] D. Briggs, *X-ray photoelectron spectroscopy (XPS)*, *Handb. Adhes.* Second Ed. (2005) 621–622. <https://doi.org/10.1002/0470014229.ch22>.
- [190] C. Zhang, C. Wang, W. Zhan, Y. Guo, Y. Guo, G. Lu, A. Baylet, A. Giroir-Fendler, Catalytic oxidation of vinyl chloride emission over LaMnO₃ and LaB_{0.2}Mn_{0.8}O₃ (B=Co, Ni, Fe) catalysts, *Appl. Catal. B Environ.* 129 (2013) 509–516. <https://doi.org/10.1016/j.apcatb.2012.09.056>.
- [191] B. Prajapati, S. Kumar, M. Kumar, S. Chatterjee, A.K. Ghosh, Investigation of the physical properties of Fe: TiO₂-diluted magnetic semiconductor nanoparticles, *J.*

- Mater. Chem. C 5 (2017) 4257–4267. <https://doi.org/10.1039/c7tc00233e>.
- [192] Y. Naruse, A. Takamori, Orbital Phase Perspective of Goodenough-Kanamori-Anderson Rules (GKA Rules) in Superexchange Interaction, ChemRxiv (2021) 1–14.
- [193] Y. Bai, Y. Xia, H. Li, L. Han, Z. Wang, X. Wu, S. Lv, X. Liu, J. Meng, A-site-doping enhanced B-site ordering and correlated magnetic property in $\text{La}_{2-x}\text{Bi}_x\text{CoMnO}_6$, J. Phys. Chem. C 116 (2012) 16841–16847. <https://doi.org/10.1021/jp302735x>.
- [194] Y.K. Jo, J.M. Lee, S. Son, S.J. Hwang, 2D inorganic nanosheet-based hybrid photocatalysts: Design, applications, and perspectives, J. Photochem. Photobiol. C Photochem. Rev. 40 (2019) 150–190. <https://doi.org/10.1016/j.jphotochemrev.2018.03.002>.
- [195] A.K. Pramanik, A. Banerjee, Finite-size effect on the evolution of Griffiths phase in manganite nanoparticles, J. Phys. Condens. Matter 28 (2016). <https://doi.org/10.1088/0953-8984/28/35/35LT02>.
- [196] J. Herbst, F. Pinkerton, Law of approach to saturation for polycrystalline ferromagnets: Remanent initial state, Phys. Rev. B - Condens. Matter Mater. Phys. 57 (1998) 10733–10739. <https://doi.org/10.1103/PhysRevB.57.10733>.
- [197] M. Das, P. Dutta, S. Giri, S. Majumdar, Octahedral tilting and the emergence of ferrimagnetism in cobalt-ruthenium based double perovskites, J. Phys. Condens. Matter 31 (2019). <https://doi.org/10.1088/1361-648X/ab27f5>.
- [198] H.S. Nair, T. Chatterji, A.M. Strydom, Antisite disorder-induced exchange bias effect in multiferroic Y_2CoMnO_6 , Appl. Phys. Lett. 106 (2015) 1–5.

<https://doi.org/10.1063/1.4906204>.

- [199] D.S. Rana, D.G. Kuberkar, S.K. Malik, Field-induced abrupt change in magnetization of the manganite compounds $(\text{LaR})_{0.45}(\text{CaSr})_{0.55}\text{MnO}_3$ (R=Eu and Tb), *Phys. Rev. B - Condens. Matter Mater. Phys.* 73 (2006) 2–7. <https://doi.org/10.1103/PhysRevB.73.064407>.
- [200] P.R. Mandal, R. Sahoo, T.K. Nath, Magnetic, dielectric and magneto-dielectric behavior of half-doped LaSrCoMnO_6 , *Phys. B Condens. Matter* 448 (2014) 64–68. <https://doi.org/10.1016/j.physb.2014.04.058>.
- [201] M. Mostovoy, A. Scaramucci, N.A. Spaldin, K.T. Delaney, Temperature-dependent magnetoelectric effect from first principles, *Phys. Rev. Lett.* 105 (2010) 1–4. <https://doi.org/10.1103/PhysRevLett.105.087202>.
- [202] M.K.H. Bhuiyan, M.A. Gafur, M.N.I. Khan, A.A. Momin, A.K.M.A. Hossain, Correlations of Structural, Dielectric, Magnetic and Magnetoelectric Properties of $\text{Ca}_{1-x}\text{Sr}_x(\text{Fe}_{0.5}\text{Ta}_{0.5})\text{O}_3$; Multiferroic Ceramics, *Mater. Sci. Appl.* 08 (2017) 64–84. <https://doi.org/10.4236/msa.2017.81005>.
- [203] U. Dutta, A. Haque, M. Motin Seikh, Synthesis, structure and magnetic properties of Ti-doped $\text{La}_2\text{MnNiO}_6$ double perovskite, *Chim. Techno Acta* 6 (2019) 80–92. <https://doi.org/10.15826/chimtech.2019.6.3.01>.
- [204] S. Lentijo-Mozo, D. Deiana, E. Sogne, A. Casu, A. Falqui, Unexpected Insights about

- Cation-Exchange on Metal Oxide Nanoparticles and Its Effect on Their Magnetic Behavior, *Chem. Mater.* 30 (2018) 8099–8112. <https://doi.org/10.1021/acs.chemmater.8b04331>.
- [205] R. Ramesh, et al. et al., Epitaxial BiFeO₃ Multiferroic Thin Film Heterostructures, *ChemInform* 34 (2003) 1719–1722. <https://doi.org/10.1002/chin.200324015>.
- [206] S.S. Arafat, S. Ibrahim, Study of the Structural and Electrical Properties of Cr-Doped BiFeO₃; *Ceramic, Mater. Sci. Appl.* 08 (2017) 716–725. <https://doi.org/10.4236/msa.2017.810051>.
- [207] A. Halder, K.G. Suresh, A.K. Nigam, Magnetism in gallium-doped CeFe₂: Martensitic scenario, *Phys. Rev. B - Condens. Matter Mater. Phys.* 78 (2008) 1–8. <https://doi.org/10.1103/PhysRevB.78.144429>.
- [208] H.S. Nair, R. Pradheesh, Y. Xiao, D. Cherian, S. Elizabeth, T. Hansen, T. Chatterji, T. Brückel, Magnetization-steps in Y₂CoMnO₆ double perovskite: The role of antisite disorder, *J. Appl. Phys.* 116 (2014). <https://doi.org/10.1063/1.4896399>.
- [209] J. Blasco, J.A. Rodríguez-Velamazán, G. Subías, J.L. García-Muñoz, J. Stankiewicz, J. García, Spin ordering and physical properties of NaPrFeWO₆ and NaSmFeWO₆ with polar double perovskite structure, *Acta Mater.* 176 (2019) 53–62. <https://doi.org/10.1016/j.actamat.2019.06.045>.
- [210] Ф. Котлер, No TitleМаркетинг по Котлеру, (2008) 282.
- [211] W.Z. Yang, X.Q. Liu, H.J. Zhao, Y.Q. Lin, X.M. Chen, Structure, magnetic, and dielectric characteristics of Ln₂NiMnO₆ (Ln = Nd and Sm) ceramics, *J. Appl. Phys.*

112 (2012). <https://doi.org/10.1063/1.4752262>.

- [212] A.P. de Moura, L.H. Oliveira, I.C. Nogueira, P.F.S. Pereira, M.S. Li, E. Longo, J.A. Varela, I.L. V. Rosa, Synthesis, Structural and Photophysical Properties of Gd^{2+} ; O^{3+} ; Eu^{3+} ; Nanostructures Prepared by a Microwave Sintering Process, *Adv. Chem. Eng. Sci.* 04 (2014) 374–388. <https://doi.org/10.4236/aces.2014.43041>.
- [213] S.C. McGuire, W. Wesley, K. Sasaki, X. Tong, S.S. Wong, Yttrium-based Double Perovskite Nanorods for Electrocatalysis, *ACS Appl. Mater. Interfaces* 14 (2022) 30914–30926. <https://doi.org/10.1021/acsami.2c07377>.
- [214] X. Cui, K. Takahashi, T. Otsuki, H. Iwai, C. Egawa, Partial oxidation reaction of methanol on Cu/MnO thin films grown on Ni (100) surface, *E-Journal Surf. Sci. Nanotechnol.* 7 (2009) 898–903. <https://doi.org/10.1380/ejssnt.2009.898>.
- [215] E. Rattigan, Z. Sun, T. Gallo, M.A. Nino, S. de O. Parreiras, C. Martín-Fuentes, J.C. Martín-Romano, D. Écija, C. Escudero, I. Villar, J. Rodríguez-Fernández, J. V. Lauritsen, The cobalt oxidation state in preferential CO oxidation on CoOx/Pt(111) investigated by operation X-ray photoemission spectroscopy, *Phys. Chem. Chem. Phys.* 24 (2022) 9236–9246. <https://doi.org/10.1039/d2cp00399f>.
- [216] J.G. Kim, D.L. Pugmire, D. Battaglia, M.A. Langell, Analysis of the NiCo₂O₄ spinel surface with Auger and X-ray photoelectron spectroscopy, *Appl. Surf. Sci.* 165 (2000) 70–84. [https://doi.org/10.1016/S0169-4332\(00\)00378-0](https://doi.org/10.1016/S0169-4332(00)00378-0).

- [217] N. Moutis, I. Panagiotopoulos, M. Pissas, D. Niarchos, Structural and magnetic properties of $\text{La}_{0.67}\text{Ba}$, *Phys. Rev. B* 59 (1999) 1129–1133.
- [218] D. Yang, G.I. Lampronti, C.R.S. Haines, M.A. Carpenter, Magnetoelastic coupling behavior at the ferromagnetic transition in the partially disordered double perovskite $\text{La}_{2-x}\text{NiMn}_x\text{O}_6$, *Phys. Rev. B* 100 (2019) 1–15. <https://doi.org/10.1103/PhysRevB.100.014304>.
- [219] R.P. Madhugaria, E.M. Clements, V. Kalappattil, M.H. Phan, H. Srikanth, R. Das, N.T. Dang, D.P. Kozlenko, N.S. Bingham, Metamagnetism and kinetic arrest in a long-range ferromagnetically ordered multi caloric double perovskite Y_2CoMnO_6 , *J. Magn. Mater.* 507 (2020) 166821. <https://doi.org/10.1016/j.jmmm.2020.166821>.
- [220] M.A. Manekar, S. Chaudhary, M.K. Chattopadhyay, K.J. Singh, S.B. Roy, P. Chaddah, First-order transition from antiferromagnetism to ferromagnetism in (formula presented), *Phys. Rev. B - Condens. Matter Mater. Phys.* 64 (2001) 1–5. <https://doi.org/10.1103/PhysRevB.64.104416>.
- [221] S. Jana, P. Aich, P.A. Kumar, O.K. Forslund, E. Nocerino, V. Pomjakushin, M. Månsson, Y. Sassa, P. Svedlindh, O. Karis, V. Siruguri, S. Ray, Revisiting Goodenough-Kanamori rules in a new series of double perovskites $\text{LaSr}_{1-x}\text{Ca}_x\text{NiReO}_6$, *Sci. Rep.* 9 (2019) 1–10. <https://doi.org/10.1038/s41598-019-54427-0>.
- [222] B. Amin, I. Ahmad, M. Maqbool, N. Ikram, Y. Saeed, A. Ahmad, S. Arif, Generalized gradient calculations of structural, electronic and optical properties of $\text{Mg}_x\text{Cd}_{1-x}\text{O}$

oxides, J. Alloys Compd. 493 (2010) 212–218.
<https://doi.org/10.1016/j.jallcom.2009.12.057>.

[223] J. Blasco, G. Subías, J. García, J. Stankiewicz, C. Ritter, Origin of the multiferroic-like properties of $\text{Er}_2\text{CoMnO}_6$, 257 (2017) 95–98.

[224] J.W. Kim, Y. Kamiya, E.D. Mun, M. Jaime, N. Harrison, J.D. Thompson, V. Kiryukhin, H.T. Yi, Y.S. Oh, S.W. Cheong, C.D. Batista, V.S. Zapf, Multiferroicity with coexisting isotropic and anisotropic spins in $\text{Ca}_{3-x}\text{Co}_2\text{Mn}_x\text{O}_6$, Phys. Rev. B - Condens. Matter Mater. Phys. 89 (2014) 4–8.
<https://doi.org/10.1103/PhysRevB.89.060404>.

List of Publications:

- 1) Coexistence of large dielectric constant and strong meta-magnetic state in $\text{Eu}_2\text{CoMnO}_6$, Mohd Alam, **Dheeraj Kumar**, *et. al.*, *physica status solidi(b)* **260** 2300305 (2023).
- 2) Observation of the multiple magnetic phases in double perovskite $\text{Pr}_{1.8}\text{La}_{0.2}\text{CoFeO}_6$, **Dheeraj kumar**, *et. al.*, (MAGMA-D-24-00262R2 JMMM (2024)).
- 3) Electrical and magnetic properties of double perovskite material $\text{Y}_{2-x}\text{Ca}_x\text{CoMnO}_6$ ($x = 0.1, 0.2, 0.5$), **Dheeraj kumar**, *et. al.*, (JMSE-D-24-02262R2).
- 4) Observation of structural change driven Griffiths to non-Griffiths-like phase transformation in $\text{Pr}_{2-x}\text{Sr}_x\text{CoFeO}_6$ ($x = 0 - 1$). Arkadeb Pal, **Dheeraj kumar**, *et. al.*, *J. Magn. Magn. Mater.* **562**, 169764 (2022).
- 5) Multifunctional property of EuPrCoMnO_6 , Mohd. Alam, **Dheeraj kumar**, *et. al.*, *J. Phys. D: Appl. Phys.* **55** 255003 (2022).
- 6) The giant dielectric constant, magnetocaloric effect, and spin-phonon coupling in EuTbCoMnO_6 semiconductor, Mohd Alam, **Dheeraj kumar**, *et. al.*, *Physica B: Condensed Matter* **665** 415043 (2023).

Workshops / Conference Attended

1. “64th DAE Solid State Physics Symposium” Organized by BARC Mumbai, IIT Jodhpur, Rajasthan, 19-22 December 2022. Ist International e-Conference on Recent Advances.
2. “Online Workshop on Rietveld Refinement Method” Organized online by UGC-DAE Consortium for Scientific Research, 22-24 September 2020.
3. Instrumentation Techniques in Chemical Sciences, Department of Chemistry, Veer Bahadur Singh Purvanchal University Jaunpur, 222003, Uttar Pradesh, India, June 25-29, 2021.
4. IQAC Initiated UGC-STRIDE Sponsored *Two Day International e-Conference on “Material Science and Technology - 2020” organized by KLE Society’s S. Nijalingappa College, Bangalore, India-560010 on 9th & 10th October 2020.*
5. 1st International e-Conference on Recent Advances in Physics & Materials Science-2020(ICRAPMS-2020) *Organized by Kurseong College, Darjeeling, West Bengal, India.*
6. The Department of 1st Year Engineering and School of Applied Sciences Organized a Day Webinar On Material Characteristics using X-rays as Probes on 29 August 2020.
7. “Advancement in functional materials” ICAFMS-2024 Organized by VBSPU Jaunpur, Feb 8-10,2024.