

Dr. Pradip Das

Assistant Professor
Department of Pure and Applied Physics
Guru Ghasidas University (Central University)
Koni, Bilaspur 495 009, India
Email Id: pradipd.iitb@gmail.com
Phone: 09407734453



Education Background:

2009 Ph. D. Department of Physics, Indian Institute of Technology Bombay
2002 M.Sc. (Physics) Department of Physics, Indian Institute of Technology Roorkee
2000 B. Sc. (Physics Hons.) University of Burdwan, Burdwan
2001 Cleared National Eligibility Test (NET)
2003 Cleared Graduate Aptitude Test in Engineering (GATE)
2003 Cleared Joint Entrance Screening Test (JEST)

Postdoctoral & Faculty Job Experience

August 2012 - till date	Assistant Professor, Guru Ghasidas University, Bilaspur,
January 2010 - July 2012	Postdoctoral Fellow, Institute of Materials Science, University of Tsukuba, Tsukuba, Japan
February 2009 - December 2009	Research Associate, Dept. of Condensed Matter Physics & Materials Sciences, Tata Institute of Fundamental Research, Mumbai, India

Project

2014- 2017	DST-SERB Fast Track Research Project: "Synthesis of topological insulators and Investigation of their topological properties by transport, magnetization, Hall Measurements" (22 lakh)
2018-2021	IUAC, New Delhi, "Weak antilocalization and quantum oscillations in topological insulator using ion irradiation" (6 lakh)
2018-2021	UGC DAE CSR, Indore, "Topological insulator based energy efficient and thermoelectric power generation materials" (1.5 lakh)

Papers in Refereed Journals

1. Unusual Conductance Fluctuations and Quantum Oscillation in Mesoscopic Topological Insulator PbBi₄Te₇, P.Mal, B.Das, A.Lakhani, G.Bera, G.R.Turpu, J.C.Wu, C.V.Tomy, **Pradip Das, Scientific Reports, 9 7018 (2019) IF 4.011**
2. Vibrational Spectra of Pb₂Bi₂Te₃, PbBi₂Te₄ and PbBi₄Te₇ Topological Insulators: Temperature Dependent Raman and Theoretical Insight from DFT Simulations, Priyanath Mal, G. Bera, G. R.Turpu, S. K. Srivastava, A. Gangan, B. Chakraborty, Bipul Das and **Pradip Das, Phy. Chem. Chem. Phy. 21, 15030-15039 (2019) IF 3.567**

3. Magneto-Lattice Coupling, Magnetic Frustration and Magneto-Electric Effect in Cr doped FeVO₄ Multiferroic Material and their correlation with Structural Phase Transitions, G.Bera, A.Surampally, A.Mishra, P.Mal, V.R.Reddy, A. Banerjee, A.Sagdeo, **P. Das**, G. R. Turpu, **Phy. Rev. B** **100** 014436 (2019) IF **3.736**
4. Comparative electrochemical analysis of rGO- R-FeVO₄ nanocomposite and FeVO₄ for supercapacitor application, A.Mishra, G.Bera, P.Mal, P.Sen, B.Chakraborty, **P.Das**, G.Padmaja and G.R.Turpu,, **App. Surf. Sci.** **488** 221 (2019) IF **5.155**
5. Low temperature synthesis of FeVO₄ through mechano - milling assisted solid state reaction method, G. Bera, V.R.Reddy, P. Rambabu, P. Mal, **P. Das**, G.Padmaja, and G. R. Turpu, **AIP Conf. Proceedings** **2115** 030110 (2019)
6. Multifunctionality of Partially Reduced Graphene Oxide -CrVO₄ Nano-Composite: Electrochemical and Photocatalytic Studies with Theoretical Insight from Density Functional Theory, G. Bera, A. Mishra, P.Mal, A. Sankarakumar, P. Sen, A. Gangan, B. Chakraborty, **P.Das** and G.R.Turpu, **J. Phy. Chem C.** **122** 21140 (2018) IF **4.309**
7. Synthesis and photocatalytic degradation study of methylene blue dye under visible light irradiation by Fe_{1-x}Bi_xVO₄ solid solutions ($0 \leq x \leq 1$) G. Bera, V.R.Reddy, P. Mal, **P. Das** and G. R. Turpu **AIP Conf. Proceedings** **1953** 080026 (2018)
8. Synthesis and temperature dependent Raman studies of large crystalline faces topological GeBi₄Te₇ single crystal, P. Mal, G. Bera, G. R. Turpu, S.K.Srivastava and **P. Das**, **AIP Conf. Proceedings** **1953** 70022 (2018)
9. Electronic, magnetic and spectroscopic properties of doped Mn(1-x)A_xWO₄(A = Co, Cu, Ni and Fe) multiferroic: an experimental and DFT study, P. Mal, G Bera, P Rambabu, G R Turpu, B.Chakraborty, L. M Ramaniah, R P Singh, P. Sen, **P.Das Journal of Physics: Cond. Matter** **29** 075901 (2017) IF **2.711**
10. Triclinic - monoclinic - orthorhombic (T-M-O) structural transitions in phase diagram of FeVO₄ - CrVO₄ solid solutions, G.Bera, V.R.Reddy, P. Rambabu, P. Mal, **P. Das**, N. Mohapatra, G. Padmaja, G. R. Turpu, **Journal of Applied Physics** **122** 115101(2017) IF **2.328**
11. CoFe₂O₄-decorated carbon nanotubes for the dehydration of glucose and fructose, Kalluri V. S. Ranganath, MahendraSahu, Melad Shaikh, Pramod Kumar Gavel, Kiran Kumar Atyam,SantimoyKhilaric and **Pradip Das New J. Chem** **40** 4468 (2016) IF 3.069
12. rGO -SnO₂ composites for super capacitor applications, P. Rambabu, S.K.Srivastava, **P.Das** and G.R.Turpu, **IOP Conf. Series: MSE** **159** 012169 (2016)
13. Structural characterization of FeVO₄ synthesized by co-precipitation method. G.Bera, Sourav Sinha, P. Rambabu, **P. Das**, A. K. Gupta, G. R. Turpu, **AIP Conf Proceedings** **1728** 020284 (2016)
14. Energy band gap and spectroscopic studies in Mn_{1-x}Cu_xWO₄ ($0 \leq x \leq 0.125$). P. Mal, P.Rambabu, G. R. Turpu, A. K. Gupta, B.Chakraborty, P.Sen, **P. Das**, **AIP Conf Proceedings** **1728** 020323 (2016)
15. DNA Engineered Tri-Functional Ni-Au Nano-Chain:Understanding of Its Formation and Novel Magnetic Properties, Bipul Das, Debasish Sarkar, **Pradip Das**, Madhuri Mandal **J. Nanosci. Nanotechnol.** **14(3)** 2599 (2014) IF **1.093**
16. Anomalous quadrupole feature in the mixed state of YNi₂B₂C, **Pradip Das**, C.V. Tomy, H. Takeya, S. Ramakrishnan and A.K. Grover, **Physica C** **484** 81-85 (2013) IF **0.985**
17. Magnetostatic interaction in two dimensional arrays of Cobalt nanowires. Bipul Das, K. Mandal, PintuSen, AshisBakshi, **Pradip Das**, **Physica B** **407** 3767-3773 (2012) IF **1.874**
18. Role of Cu-doping in topological insulator Bi₂Se₃ studied by angle-resolved photoemission spectroscopy Y. Tanaka, K. Nakayama, S. Souma, T. Sato, N. Xu, P. Zhang, H. Ding, Y. Suzuki, **P. Das**, Kazuo Kadowaki, and T. Takahashi, **Physical Review B** **85** 125111(2012) IF **3.736**
19. Pairing Symmetry and Magnetic Relaxation in Topological Superconductor Cu_xBi₂Se₃, **Pradip Das**, Yusuke Suzuki, Masashi Tachiki and Kazuo Kadowaki, **J. Phys.: Conf. Ser.** **400** 113917 (2012)

20. Pinning mechanism in iron chalcogenide superconductor $\text{FeSe}_{0.5}\text{Te}_{0.5}$ Ajay D Thakur, Anil K Yadav, **P Das**, CV Tomy, MR Lees, G Balakrishnan, S Ramakrishnan, AK Grover, **AIP Conference Proceedings 1447 (1)** 897-898 (2012)
21. Magnetization hysteresis and time decay measurements in $\text{FeSe}_{0.50}\text{Te}_{0.50}$: Evidence for fluctuation in mean free path induced, **P. Das**, Ajay. D. Thakur, Anil K. Yadav, C. V. Tomy, M.R. Lees, G. Balakrishnan, S. Ramakrishnan, A. K. Grover, **Phys. Rev. B** **84** 214526 (2011) IF **3.736**
22. Spin-triplet vortex state in the topological superconductor $\text{Cu}_x\text{Bi}_2\text{Se}_3$, **Pradip Das**, Yusuke Suzuki, Masashi Tachiki, and Kazuo Kadowaki, **Phys. Rev. B. Rapid Communication**, **83** 220513(R) (2011) **3.736** (Cited in **Physics spotlight exceptional research by American Physical Society** (<http://physics.aps.org/synopsis-for/10.1103/PhysRevB.83.220513>))
23. Anisotropy in the vortex phase diagram and the pinning force density in the basal plane of $\text{YNi}_2\text{B}_2\text{C}$ **Pradip Das**, C.V. Tomy, H. Takeya, S. Ramakrishnan and A.K. Grover **Physica C** **469** 151(2009) IF **0.985**
24. Peak effect phenomena, surface superconductivity and paramagnetic Meissner effect in a spherical single crystal of niobium., **Pradip Das**, C.V. Tomy, H. Takeya, S. Ramakrishnan and A.K. Grover **J. Phys.: Conf. Ser.** **150** 052041(2009)
25. Thermo-magnetic history effects in the vortex state of $\text{YNi}_2\text{B}_2\text{C}$ superconductor, **Pradip Das**, C.V. Tomy, H. Takeya, S. Ramakrishnan and A.K. Grover, **J. Phys.: Conf. Ser.** **150** 052042 (2009)
26. Peak effect phenomena, surface superconductivity and positive field cooled magnetization in a spherical single crystal of niobium, **Pradip Das**, C.V. Tomy, S.S. Banerjee, H. Takeya, S. Ramakrishnan and A.K. Grover, **Phys. Rev. B.** **78** 214504 (2008) IF **3.736** Appeared as **focus new item in Nature India section of Nature Magazine** <http://www.nature.com/nindia/2008/081228/full/nindia.2008.342.html>
27. Growth of textured nanocrystalline cobalt ferrite thin films by pulsed laser deposition, L. Aditya, A. Srivastava, S. K. Sahoo, **P. Das**, C. Mukherjee, Abha Misra, V.R. Reddy, R. S. Shinde, Ajay Gupta, Shiva Prasad, I. Samajdar, R. V. Nandedkar, and N. Venkataramani, **J. Nanosci. Nanotechnol** **8** 4135 (2008) IF **1.093**
28. Spin compensation in $\text{YbSr}_2\text{RuO}_6$ Ravi P. Singh, **Pradip Das**, C.V. Tomy **AIP Proceedings** **1003** 151(2008)

Conference Proceedings

1. Observation of surface superconductivity and paramagnetic Meissner effect in a spherical single crystal of Nb **Pradip Das**, C.V. Tomy, H. Takeya, S. Ramakrishnan and A.K. Grover **Solid State Physics (India)** **53**, 917 (2007)
2. Dynamical response of Flux line lattice: a ramp rate dependence magnetic isotherm study in single crystal $\text{YNi}_2\text{B}_2\text{C}$ **Pradip Das**, C.V. Tomy, H. Takeya, S. Ramakrishnan and A.K. Grover **Solid State Physics (India)** **52**, 817 (2007).
3. Magnetization Reversal in $\text{YbSr}_2\text{RuO}_6$ Ravi P. Singh, **Pradip Das**, C.V. Tomy **Solid State Physics (India)** **52**, 1037 (2007).
4. Study of Pulsed Laser Deposition of Nanocrystalline GaFeO_3 thin film on single crystal YSZ (100) substrate as a function of temperature **Pradip Das**, Ravi P. Singh, Devang A. Joshi, C.V. Tomy, D. S. Misra **Proceedings of the Advance Nano Materials**, p. 299 (2007).
5. Synthesis of High Purity Multi walled carbon nanotube using ferrocene as catalyst in thermal chemical vapor deposition Pawan K. Tyagi, Abha Misra, Padmnabh Rai, Dipti Ranjan Mahapatro, **Pradip Das**, E. Titus, D.S. Misra, Jay Ghatak, P.V. Satyam **Proceedings of the Advance Nano Materials** p. 64 (2007).
6. Magnetic Properties of RNi_3FeGa compound (R = Y, La and Gd) Devang A. Joshi, Ravi P. Singh, **Pradip Das**, C.V. Tomy and S. K. Malik **Solid State Physics (India)** **51**, 921 (2006).

7. Single crystalline nickel nanorods encapsulated inside carbon nanotubes Pawan K. Tyagi, Abha Misra, Manoj K. Singh, **Pradip Das**, D.S. Misra, Jay Ghatak, P.V. Satyam Solid State Physics (India) 49, 201 (2004).
8. Anisotropy Study by Torque Measurements and the Magnetic Relaxation Measurements in a Single Crystal of the Superconductor FeSe_{0.5}Te_{0.5}, **Pradip Das**, presented as an poster presentation at the “7th International Symposium on Intrinsic Josephson Effects and Plasma Oscillations in High-Tc Superconductors”, April 29th – May 2nd, Hirosaki University, Aomori, Japan.
9. Synthesis and Study of FeP Single Crystals, A. Nozawa, T. Goya, H. Yamaguchi, Y. Jono, Y. Suzuki, **P. Das**, S. Hashimoto, T. Yamamoto, T. Kashiwagi and K. Kadowaki, presented as poster presentation at the “4th AEARU Advanced Materials Workshop on Artificial and Self-Organized Nanostructure Sciences and Nano-Technologies for the Sustainable World”, held in August 29th - September 3rd, 2010, in University of Tsukuba, Tsukuba, Japan
10. Single Crystal Growth of Topological Insulator CuxBi₂Se₃, Y. Suzuki, **P. Das**, S. Hashimoto, T. Goya, Y. Jono, T. Yamamoto, H. Yamaguchi, A. Nozawa, T. Kashiwagi and K. kadowaki, presented as poster presentation at the “4th AEARU Advanced Materials Workshop on Artificial and Self-Organized Nanostructure Sciences and Nano-Technologies for the Sustainable World”, held in August 29th - September 3rd, 2010, in University of Tsukuba, Tsukuba, Japan
11. Synthesis and Physical Properties of BaFe₂(As_{1-x}P_x)₂ Single Crystals, Y. Jono, S. V. Chong, T. Goya, H. Yamaguchi, **P. das**, T. Yamamoto, S. Hashimoto, Y. Suzuki, A. Nozawa, T. Kashiwagi, R. Yoshizaki and K. Kadowaki, presented as poster presentation at the “4th AEARU Advanced Materials Workshop on Artificial and Self-Organized Nanostructure Sciences and Nano-Technologies for the Sustainable World”, held in August 29th - September 3rd, 2010, in University of Tsukuba, Tsukuba, Japan.
12. Single Crystal Growth of Iron Based Superconductors by Vertical Bridgeman Method, H. Yamaguchi, T. Goya, Y. Jono, **P. Das** and K. Kadowaki, presented as poster presentation at the “4th AEARU Advanced Materials Workshop on Artificial and Self-Organized Nanostructure Sciences and Nano-Technologies for the Sustainable World”, held in August 29th - September 3rd, 2010, in University of Tsukuba, Tsukuba, Japan.
13. Topological Insulator CuxBi₂Se₃ and CaxBi_{2-x}Se₃, **P. Das**, Y. Suzuki, S. Hashimoto, T. Goya, T. Yamamoto and K. Kadowaki, presented as poster presentation at the “4th AEARU Advanced Materials Workshop on Artificial and Self-Organized Nanostructure Sciences and Nano-Technologies for the Sustainable World”, held in August 29th - September 3rd, 2010, in University of Tsukuba, Tsukuba, Japan.
14. Synthesis and Physical Properties of 122 System of Iron-Based Superconductors, Touhei Jono, Tomoki Goya, Hisato Yamaguchi, **Pradip Das**, Shinya Hashimoto, Yusuke Suzuki, Akihiko Nozawa and Kazuo Kadowaki, presented at the 3rd International Symposium on Interdisciplinary Materials Science (ISIMS-2011)” held at Tsukuba International Congress Center (EPOCHAL), Tsukuba, Ibaraki, Japan, March 9-11, 2011.
15. Synthesis and Characterization of Prototype iron Based Superconductors, Akihiko Nozawa, Tomoki Goya, HHisato Yamaguchi, Yohei Jono, Yusuke Suzuki, **Pradis Das**, Shinya Hashimoto, Takashi Yamamoto, Takanari Kashiwagi, Ryoza Yoshizaki and Kazuo Kadowaki, presented at the “3rd International Symposium on Interdisciplinary Materials Science (ISIMS-2011)” held at Tsukuba International Congress Center (EPOCHAL), Tsukuba, Ibaraki, Japan, March 9-11, 2011.
16. Single Crystal Growth and Physical Properties of Topological Insulator Bi₂Se₃, Y. Suzuki, **P. Das**, H. Yamaguchi, T. Goya, Y. Jono, A. Nozawa, S. Hashimoto, T. Yamamoto, R. Yoshizaki, T. Kashiwagi and K. Kadowaki, presented at the “3rd International Symposium on Interdisciplinary Materials Science

(ISIMS-2011)” held at Tsukuba International Congress Center (EPOCHAL), Tsukuba, Ibaraki, Japan, March 9-11, 2011.

17. Magnetization Studies in a Topological Insulator $Cu_xBi_2Se_3$ Single Crystal, **Pradip Das**, Y. Suzuki, M. Tachiki and K. Kadowaki, presented at the “3rd International Symposium on Interdisciplinary Materials Science (ISIMS-2011)” held at Tsukuba International Congress Center (EPOCHAL), Tsukuba, Ibaraki, Japan, March 9-11, 2011.

18. Topological Insulator $Cu_xBi_2Se_3$ and $CaBi_{2-x}Se_3$, **Pradip Das**, S. Hashimoto, T. Goya, Y. Suzuki, T. Yamamoto, K. Kadowaki, 2010 Fall Meeting of the Physical Society of Japan (Osaka Prefecture 中百舌鳥 held at the campus), September 23, 2010, 8 iron-arsenic superconductor region (23pWH-8), the third volume, Volume 65 Number 2 Physical Society of Japan Abstracts pp502.

19. High-resolution ARPES in $Cu_xBi_2Se_3$ superconductors, Y. Tanaka, K. Umezawa, Keisuke Koji Nakayama, old Soma, 宇史 Sato, Yusuke Suzuki, **Pradip Das**, K. Kadowaki, T. Takahashi, Fall Meeting of the Physical Society of Japan 2011 (University of Toyama campus), September 21 to 24, 2011.

20. Doping dependence of superconductivity in $Cu_xBi_2Se_3$, Y. Suzuki*, **Pradip Das**, M. Tachiki and K. Kadowaki, Fall Meeting of the Physical Society of Japan 2011 (University of Toyama campus), September 21 to 24, 2011.

21. Anomalous quadrupole feature in the mixed state of YNi_2B_2C , **Pradip Das**, C.V. Tomy, H. Takeya, S. Ramakrishnan and A.K. Grover, ISS 2011 (Tower Hall Funabori, Tokyo, Japan, Oct. 24-26, 2011)

22. Conductance Fluctuations and Quantum Oscillation in Topological Insulator $PbBi_4Te_7$ 1st International Conference on Advance in Nanomaterials and Device for Energy and Environment, ABV-IITM Gwalior 27-29 Jan, 2019

23. Conductance Fluctuations and Quantum Oscillation in Topological Insulator National seminar on Recent Trends in Physics Bidhan Chandra College Asansol 19th January, 2019 Bulk and surface transport properties of $PbBi_2Te_4$ topological insulator National Conference on Graphene and Functional Materials CSIR-Central Mechanical Engineering Research Institute 23-24 Feb, 2018

24. Spectroscopic, electronic and magnetic properties of doped $Mn_{1-x}AxWO_4$ (A=Co, Cu, Ni & Fe) International Conference on Emerging Materials and Applications, University of Allahabad 20-22 Feb, 2018

25. Synthesis and Transport Properties of the Topological Insulator $Bi_{1-x}Sb_xTe_{1-y}Se_y$ & $Cu_xBi_2(Se_{1-y}Te_y)_3$ National conference on Environmental Radiation and Functional Materials, Department of Physics, Osmania University, Hyderabad February 28- March 1, 2015

26. Synthesis and Raman study of topological insulators Bi_2Te_3 , Bi_2Se_3 , $PbBi_2Te_4$ and $PbBi_4Te_7$ single crystal

27. International Conference on condensed matter & Applied Physics, Department of Physics, Govt. Engineering College Bikaner 30-31 October, 2015

28 Structural and Spectroscopic Properties of Multiferroic $Mn_{1-x}CoxWO_4$ 18th National Seminar on Ferroelectrics and Dielectrics Department of Physics, Manipur University 3-5 Nov 2014

Research Interests

Presently, we are involved in investigating structural, electronic transport (longitudinal and transverse) and magnetic properties of various systems, in variety of materials e.g. from single crystal topological insulator to polycrystalline multiferroics, materials. We have studied the Shubnikov-de-Haas (SdH) oscillations accompanied by conductance fluctuations in a mesoscopic topological insulator PbBi_4Te_7 device. From SdH oscillations, the evidence of Dirac fermions with π Berry phase is found and the experimentally determined two main Fermi wave vectors are correlated to two surface Dirac cones (buried one inside the other) of layered topological insulator PbBi_4Te_7 . We have also found evidence of conductance fluctuations, the root mean square amplitude of which is much higher than the usual universal conductance fluctuations observed in nanometer size sample. The unique fluctuations may be associated with the topological surface states in the compound. A comparative study of PbBi_2Te_4 and SnBi_2Te_4 single crystal has done, which show 2D origin of weak anti localization observed in longitudinal resistivity. Non-trivial surface states of both the single crystals are confirmed from the observed half-shift of Landau index in Landau-levels fan diagram based on Shubnikov-de-Haas (SdH) oscillations, a clear manifestation of the π Berry phase of the carriers. Estimated lower effective masses from the Lifshitz-Kosevich (LK) fit and higher mobility values obtained from Dingle analysis confirms the surface origin of the oscillations of both the single crystals. Comparison of the effective mass, mobility, quantum scattering time and metallicity parameters obtained from the SdH oscillations reflects PbBi_2Te_4 to be better topological insulators over SnBi_2Te_4 . Extended surface states are observed in both the crystals which accommodate the topological surface states at the surface of the crystals. The non-trivial topological surface states in $\text{PbBi}_{2-x}\text{FexTe}_4$ have been confirmed from the observation of Shubnikov-de Haas (SdH) oscillations with π -Berry phase, unique to Dirac Fermions. 2D origin of surface states also confirmed from the Hikami-Larkin-Nagaoka (HLN) fit of the weak anti-localization in magnetic field variation of longitudinal resistivity. The mobility value obtained from the Dingle analysis enhanced by one order with successive Fe doping and lower effective mass obtained from the Lifshitz-Kosevich (LK) fit indicates the surface origin of the SdH oscillations. Tuning of Fermi level towards the Dirac point with Fe doping is evident from the Hall effect measurement as well as also from the SdH oscillations. The E-k diagram corroborates the linear Dirac dispersion of the topological surface states in PbBi_2Te_4 . In PbBi_2Te_4 we observed an extra band outside the Fermi surface is consistent with angle resolved photo emission spectroscopy (ARPES) measurements. The extra band possesses non-trivial nature associated with π Berry phase.

The influence of dopants (Co, Cu, Fe and Ni) on the optical, electronic and magnetic properties of multiferroic MnWO_4 was studied using Raman spectroscopy, ultraviolet-visible spectroscopy (UV-Vis), magnetization measurements and density functional theory (DFT) calculations. The evolution of Raman spectra with different elemental substitutions at the Mn site was also studied, where the peak width increased with doping of higher mass elements (Co, Cu, Fe and Ni). UV-Vis diffuse reflectance spectroscopy on polycrystalline $\text{Mn}_{1-x}\text{AxWO}_4$ ($A = \text{Co, Cu, Fe and Ni}$) ($0 \leq x \leq 0.1875$) was performed. The evaluated electronic band gap decreasing with successive Co, Cu and Fe doping reflected the lower ionic radius of the substituted element, and for Ni-doped MnWO_4 the band gap increased slightly compared to the parent MnWO_4 . The signature of the d-d transition observed in the UV spectra is explained in terms of the crystal field stabilization energy caused by the octahedral

distortion present in the lattice. Three different antiferromagnetic phases (AF1, AF2 and AF3) are identified in MnWO₄ and also for the Co (18.75%)-doped sample. For Cu-doped samples, suppression of the AF1 phase and stabilization of the AF2 phase is observed up to 2 K. Successive doping of Cu leads to the diminution of magnetic frustration. A new magnetic order is identified for Ni-doped MnWO₄ in the temperature range 13.7–20 K.