Rabin Mahat

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EDUCATION

PhD Candidate
The University of Alabama, Tuscaloosa, AL
Major: Condensed Matter Physics (Experiment &Theory)
GPA 4.0/4.0
Master of Science, August 2018
The University of Alabama, Tuscaloosa, AL
Major: Physics
GPA 4.0/4.0
Master of Science, August 2013
Tribhuvan University, Nepal
Major: Physics
GPA 78.50/100.00

RESEARCH SPECIALITIES

Material Growth

- Arc-melting to synthesize polycrystalline specimens (Heusler Alloys)
- Pulse Laser Deposition (PLD) and Sputtering technique for thin films (Complex Magnetic Metal Oxides; $NiFe_2O_4$, Fe_3O_4)

Material Characterizations

- Atomic force microscope (AFM), X-ray Diffraction (Brucker D8 & Phillips XRD), Scanning Electron Microscopy (JEOL7000 & Apreo Field Emission SEM), Tunneling Electron Microscopy (FEI F20 TEM), Focused Ion Beam (FIB) in FEI Quanta, Metallography for microstructural analysis, Quantum Design Physical Properties Measurement System (PPMS), Custom made Spin current detection setup, Vickers Micro-hardness, Differential Scanning Calorimetry (DSC)

Theoretical Calculation

- Phase stability, Density of States, Band Structure and Magnetization using VASP

EXPERIENCE

Research

- 1 year of experience in CVD deposition of high quality metal-oxide (VO2) thin films
- Accomplished setting-up, hardware/software installation and optimization of CVD system
- Experience and familiarity with PVD techniques, including PLD and Sputtering
- Trained on photolithography for patterning thin films
- Trained on Focused ion beam (FIB) in FEI Quanta
- Experience with XRD for studying the crystal structure of materials in thin film, bulk and powder forms
- Experience in XRD analysis using Vesta, CaRIne crystallography and the CRYSTAL IMPACT MATCH! software based on the FULLPROF algorithm for Rietveld refinement
- Utilized AFM for surface characterization of thin films
- 5+ years of experience in synthesizing bulk form materials using arc-melting for discovering novel magnetic materials and semiconductors for spintronic applications
- 5+ years of experience in metallography (grinding and polishing) for microstructural analysis . 5+ years of experience in electrical transport measurement including wire bonding and analysis of thin film, devices and bulk materials at cryogenic temperatures, including resistivity/conductivity, Spin Seebecck Effect, magnetoresistance
- 5+ years of experience in magnetic measurements and analysis of magnetic materials using QD PPMS Dynacool, VSM, AGM
- 5+ years of experience with SEM, EDS, EBSD, and optical microscope for imaging, microstructural, compositional and phase identification analysis of bulk materials and thin films

- Experience with Vickers Micro-hardness tester for Mechanical Hardness measurement
- Experience with Differential Scanning Calorimetry (DSC) to study Phase transformation
- Trained and supervised graduate and undergraduate level students on different instrumentation and techniques: such as, electrical transport measurements, wire bonding, magnetometry, metallography, electron microscopy and XRD analysis

Graduate Teaching Assistant, University of Alabama, Tuscaloosa, AL (Jan 2016-Present)

- Taught laboratory courses for General Physics W/Calc I (PH105, PH 101) & General Physics W/Calc II (PH106, PH 102) and held help desks for undergraduate Physics courses

Graduate Teaching Assistant, University of Alaska Fairbanks, Fairbanks, AK (Aug 2015- Dec 2015)

- Taught laboratory courses for General Physics W/Calc I (PH211) and held help desks for undergraduate Physics courses

Physics Lecturer, Mahakavi Devkota Memorial Higher Secondary School, Nepal (Jun 2013-Aug 2015)

RESEARCH PUBLICATIONS

Journal Articles

- **R. Mahat,** S. KC, U. Karki, J. Law, V. Franco, I. Galanakis, A. Gupta & P. LeClair, Possible half-metallic behavior of $Co_{2-x}Cr_xFeGe$ Heusler alloys: Theory and Experiment. *Manuscripted submitted for publication on PRB (2021).*
- **R. Mahat,** S. KC, D. Wines, S. Regmi, U. Karki, Z. Li, F. Earsan, J. Law, C. Ataca, V. Franco, A. Gupta & P. LeClair, Influence of Cr-substitution on the structural, magnetic, electron transport, and mechanical properties of $Fe_{3-x}Cr_xGe$ Heusler alloys. *Journal of Magnetism and Magnetic Materials, 521, 167398 (2021).*
- **R. Mahat,** S. KC, D. Wines, S. Regmi, U. Karki, R. White, F. Earsan, C. Ataca, P. Padhan, A. Gupta & P. LeClair, Tuneable structure and magnetic properties in $Fe_{3-x}V_xGe$ alloys. *Journal of Alloys and Compounds, 154403 (2020).*
- S. KC, **R. Mahat**, S. Regmi, A. Mukherjee, P. Padhan, R. Datta, W. H. Butler, A. Gupta, & P. LeClair, Tunable properties and potential half-metallicity in $(Co_{2-x}Ti_x)FeGe$ Heusler alloys: An experimental and theoretical investigation. *Phys Rev Materials, 3, 114406 (2019).*

Conference Proceedings

- **R. Mahat**, S. KC, U. Karki, J. Law, V. Franco, I. Galanakis, A. Gupta, & P. LeClair, Effect of mixing the low-valent transition metal atoms Y = Sc, Ti, V, Cr, Mn and Fe on the properties of quaternary Heusler compounds $Co_{2-x}Y_xFeSi$ ($0 \le x \le 1$). *INTERMAG virtual conference (2021).*
- **R. Mahat**, S. KC, U. Karki, S. Regmi, J. Law, V. Franco, I. Galanakis, A. Gupta, & P. LeClair, Influence of mixing the low-valent transition metal atoms Y = Sc, Ti, V, Cr, Mn and Fe on the properties of possible half-metallic Heusler compounds $Co_{1.5}Y_{0.5}FeSi$. *Bulletin of the American Physical Society (2021).*
- **R. Mahat,** S. KC, U. Karki, J. Law, V. Franco, I. Galanakis, A. Gupta & P. LeClair, Possible Half-Metallic Behavior of Co2−xCrxFeGe Heusler Alloys: Theory and Experiment. *Annual Virtual Conference on Magnetism and Magnetic Materials (2020).*
- **R. Mahat**, D. Wines, S. KC, S. Regmi, U. Karki, F. Ersan, C. Ataca, A. Gupta, & P. LeClair, Effect of V substitution on structural, magnetic, transport and mechanical properties of the half-metal-type Heusler alloy Co_2FeGe. *Bulletin of the American Physical Society (2020).*
- **R. Mahat**, S. KC, D. Wines, S. Regmi, U. Karki, F. Ersan, J. Law, C. Ataca, V. Franco, A. Gupta, & P. LeClair, Effect of low-valent transition metals V and Cr substitution on structural, magnetic, transport and mechanical properties of the half-metal-type Heusler alloy Co_2FeGe. *Southeastern Universities Graduate Research Symposium*, https://esprmc-symposium.ua.edu/ (2020).
- **R. Mahat**, S. KC, D. Wines, S. Regmi, U. Karki, F. Ersan, C. Ataca, A. Gupta, & P. LeClair, Tuning structural and magnetic properties by vanadium substitution in Fe_3Ge. *Bulletin of the American Physical Society 2019).*
- **R. Mahat**, S. KC, D. Wines, S. Regmi, U. Karki, F. Ersan, P. Padhan, C. Ataca, A. Gupta, & P. LeClair, Theoretical and experimental study of influence of mixing the low-valent transition metal atoms (Y= V, and Cr) on the structural, magnetic, transport, and mechanical properties of $Fe_{3-x}Y_xGe$ Heusler alloys. *Annual Conference on Magnetism and Magnetic Materials (2019).*
- **R. Mahat**, S. KC, D. Wines, S. Regmi, U. Karki, R. White, F. Ersan, C. Ataca, A. Gupta, & P. LeClair, Tunable structural, magnetic, electrical and mechanical properties by Vanadium substitution in $Fe_{3-x}V_xGe$. *Materials Science Symposium in University of Alabama (2019).*

SKILLS

Languages

- English, Nepali, Hindi

Coding

- Python, MySQL, Matlab, LabView, OriginLab, Microsoft Office, Linux, LaTeX, VASP for DFT calculations

Miscellaneous

- Academic research, Teaching, Statistical Process Control (SPC)

AWARDS AND ACHIEVEMENTS

- Travel Grant for APS March Meeting 2019 (Boston, USA)
- Travel Grant for Magnetism and Magnetic Materials (MMM) Conference 2019 (Las Vegas, USA) 2020
- Travel Grant for APS March Meeting 2020 (Colorado, USA)
- Poster Presentation Merit Award, Southeastern Universities Graduate Research Symposium, Alabama, USA
- Magnetism as art finalist award in MMM 2020
- Departmental Prize for Outstanding Student Performance, Central Department of Physics, Tribhuvan University, Nepal (2012)

CERTIFICATION

- Python for Everybody Specialization (Coursera)
- Applied Data Science with Python Specialization (Coursera)
- Google IT Automation with Python Specialization (Coursera)
- Statistical Process Control (SPC) Using Microsoft Excel (Udemy)
- The Ultimate MySQL Bootcamp: Go from SQL Beginner to Expert (Udemy)