

Dr. Santhoshkumar M

Research Associate,
School of Physics & Materials Science (SPMS),
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Research Interest

Materials science has been a part of my curriculum throughout my education. I build up my interest in static and dynamic properties of materials and its underlying physics. To be specific my recent interest is to develop High Entropy Alloys, Ferrite and Ferrite related Composite. The primary focus of my research is to develop ready to support industrial needs of materials in a convenient, reliable and cost effective methods.

Work Experience

- Research Associate** : **October 10, 2018 – July 31, 2021** [Pay – Rs. 47,000 + HRA]
Development of exchange coupled hard/soft ferrite nanocomposites for tunable microwave application.
- Teaching Associate** : **July 23, 2018 – October 09, 2018** [Pay – Rs. 25,000]
Course – Materials Science and Engineering (Graduate level – B.Tech second year)
- Teaching Associate** : **August 01, 2017 – June 30, 2018** [Pay – Rs. 25,000]
Course – Materials Science and Engineering (Graduate level – B.Tech second year)
- Junior Research Fellow** : **September 04, 2015 – July 27, 2017** [Pay – Rs. 25,000 +HRA]
Development of M-type hexaferrite film for microwave device application.

Educational Qualification

- PhD** : **Materials Science (CGPA (Course work) – 8.7/10), 2015-2021**
Thapar Institute of Engineering & Technology, Patiala, Punjab.
- Master's** : **Materials Science and Engineering (CGPA – 8.7/10), 2013-2015**
Jaypee Institute of Information Technology, Noida, Uttar Pradesh.
- Bachelor's** : **Aeronautical Engineering (CGPA – 8.6/10), 2009-2013**
Vel Tech Dr. RR & Dr.SR Technical University, Avadi, Chennai.
- H. Secondary** : **State Board (Major – Biology, Physics, Chemistry and Mathematics) (Percentage 73%), 2009**
St.Mary's Matriculation Higher Secondary School, Sriperumbudur, Kancheepuram.
- High School** : **Matric (Percentage 66%), 2007**
Holy Cresnet Matriculation School Higher Secondary, Sriperumbudur, Kancheepuram.

Thesis

PhD : Development of M-type hexaferrite films for microwave device application.

M-type hexaferrite has been extensively used in microwave devices due to its large magnetocrystalline anisotropy, high magnetization and ferromagnetic resonance frequency over 50 GHz. Its high versatility in magnetic and dielectric properties with low losses in off-resonance frequency provides a significant important in non-reciprocal devices such as circulator, isolators, phase shifter and band filters. Substantial effort has been drawn to miniaturize these devices with self- biased ferrite materials. In the present dissertation, barium hexaferrite (BaM) powders with various substitution (Al, Ti, La & Co) were prepared. To understand the insight of the substitution, the powder were characterized by Raman spectroscopy, FTIR, and Mössbauer spectroscopy. As substituted powder were used to fabricate the screen printed thick films. The microstructural and magnetic properties of the films were measured in perpendicular and in plane direction. Microwave properties of substituted sample were compared with pure BaM in X-band and Ku band. Apart from isotropic thick films, anisotropic microwave sintered thick films were also prepared under the presence of external magnetic field of 0.8 T. The effect of milling time on structural and magnetic properties of thick films were investigated.

Master's Minor: Investigation of Nanomaterials Prepared by Exploding Wire Technique.

Master's Major: Investigation of Copper Particles in Carbon Environment.

Bachelor's : Study of Sandwich Composite Floor Panel for Aircraft - Designing, Testing & characterization.

Laboratory skills

As operator : Vibrating sample magnetometer, Fourier-transform infrared spectroscopy, Sputtering and Inductively coupled plasma mass spectrometry.

As user : X-ray Diffractometer, Electron microscopy, Impedance analyzer, Vector network analyzer, Raman, Mössbauer and, X-ray photoelectron spectroscopies.

Expertise : Reitveld refinement, XPS fit, Moss fit, Origin, doFORC and Electrochemical impedance spectroscopy spectrum analyser.

Certified : Non destructive testing (NDT) level – 2 (Dye penetrant, Magnetic particle, ultrasonic and Radiographic testing), Diploma in professional CADD and computational fluid dynamics.

Course : Materials science and engineering, Nanoscience and engineering, Thin film technology, Semiconductor device and IC technology, Optoelectronics materials and devices, Photovoltaic techniques and process, Engineering ceramics and composite, Structure and characterization of materials, Thermodynamics and kinetics, Properties and processing of engineering materials, Rocket and missiles, Avionics, Aircraft stability and control, Space mechanics, Aircraft performance, Aerodynamics, Aircraft production and technology, and Strength of materials.

Publications: *h-index* - 04, *i10-index* - 02

1. **Santhoshkumar Mahadevan**, Vasant Sathe, V Raghavendra Reddy, Puneet Sharma, Site occupation and magnetic studies in La-Co substituted barium hexaferrite, IEEE Trans. Magn. 56 (2020) 1-6. DOI: 10.1109/tmag.2020.3014071
2. **Santhoshkumar Mahadevan**, Puneet Sharma, Charge transport mechanism in $\text{BaFe}_{12}\text{O}_{19}$ and $\text{BaFe}_{11}\text{CoO}_{19}$, J. Magn. Magn. Mater. 514 (2020) 167174.
3. **Santhoshkumar Mahadevan**, Sukhleen Bindra Narang, Puneet Sharma, Effect of three-step calcination on structural, magnetic and microwave properties of $\text{BaFe}_{11.5}\text{Ti}_{0.5}\text{O}_{19}$ hexaferrite, Ceram. Int. 45 (2019) 9000–9006.
4. **Santhoshkumar Mahadevan**, Chhavi Pahwa, Sukhleen Bindra Narang, Puneet Sharma, Structural, dielectric and magnetic properties of $\text{BaFe}_{12-x}\text{Al}_x\text{O}_{19}$ hexaferrite thick films, J. Magn. Magn. Mater. 441 (2017).
5. **Santhoshkumar Mahadevan**, Alok Prathap Singh Chauhan, Investigation of synthesized nanosized copper by polyol technique with graphite powder, Adv. Powder Technol. 27 (2016) 1852–1856.
6. Neha Rani, Surjeet Chahal, **Santhoshkumar Mahadevan**, Parmod Kumar, Rajni Shukla, SK Singh, Development of hierarchical magnesium oxide anchored cerium oxide nanocomposites with improved magnetic properties and photocatalytic performance, Nanotechnology. 31 (2020) 374004.
7. Samiksha Verma, **Santhoshkumar Mahadevan**, Chhavi Pahwa, Anoop Pratap Singh, Sukhleen Bindra Narang, Neha Aggarwal, Puneet Sharma, Improved Magnetic and Microwave Properties of La-Substituted Barium Hexaferrite Screen-Printed Thick Films, J. Supercond. Nov. Magn. 33 (2020) 2507–2512.
8. Chhavi Pahwa, **Santhoshkumar Mahadevan**, Sukhleen Bindra Narang, Puneet Sharma Structural, magnetic and microwave properties of exchange coupled and non-exchange coupled $\text{BaFe}_{12}\text{O}_{19}/\text{NiFe}_2\text{O}_4$ nanocomposites, J. Alloys Compd. 725 (2017) 1175–1181. **(Best paper award - 35th Convocation 2021, Thapar Institute of Engineering & Technology)**
9. Chhavi Pahwa, **Santhoshkumar Mahadevan**, Sukhleen Bindra Narang, Puneet Sharma, Studies on exchange-coupled magnetodielectric ceramics for microwave application in K_u-band, IEEE Trans. Magn. 57 (2020) 1-7.
10. Denis Vinnik, **Santhoshkumar Mahadevan** and Puneet Sharma, Magnetic study on divalent ion substituted barium hexaferrites, Defect Diffus. Forum. 410 (2021) 714-719.
11. **Santhoshkumar Mahadevan**, Alok PS Chauhan “Preparation and Characterization of Fine Copper Nanoparticles” *NCRACMS-15*, pp-48, **ISBN - 978-93-84224-25-7**. (Non-SCI).

Professional Activities:

1. Conferences & Symposium

- **Santhoshkumar Mahadevan**, Vasant Sathe, V Raghavendra Reddy, Sukhleen Bindra Narang, Puneet Sharma, “Role of anisotropy variation on magnetic and microwave performance of La-Co substituted barium hexaferrite”, 12th International Conference on Ferrites (ICF-12, 2019), October 29- November 01, 2019, Boston ,MA, USA. (**Oral presentation**).
- **Santhoshkumar Mahadevan**, Puneet Sharma “High coercive Al-substituted M-type hexaferrite thick films for microwave device application.” International Conference on Magnetism and Magnetic Materials (ICMAGMA- 2018) December 09-13, 2018, NISER, Bhubaneswar (**Poster presentation**).
- **Santhoshkumar Mahadevan**, Puneet Sharma “Effect of structural and magnetic properties of BaFe_{12-x}Al_xO₁₉ hexaferrite thick films processed via two different methodology”. Young Materials Researchers’ Meet 2017 (YMRM-2017) December 10-11, 2017, Baba Atomic Research Centre (BARC), Mumbai (**Poster presentation – Best poster award**).
- **Santhoshkumar Mahadevan**, Chhavi Pahwa, Anoop Pratap Singh and Puneet Sharma “Structural and magnetic properties of BaFe_{12-x}Al_xO₁₉ hexaferrite thick films” National symposium on materials for advanced technology (MAT-2017), February 20-21, 2017, DIT university, Dehradun (**Poster presentation – Best poster award**).
- **Santhoshkumar Mahadevan**, Puneet Sharma, “Structural, magnetic and vibrational properties of BaFe_{11.5}Ti_{0.5}O₁₉ prepared by three step calcination method” International Conference on Magnetism and Magnetic Materials (ICMAGMA- 2017) February 01-03, 2017, DMRL, Hyderabad (**Oral presentation**).
- **Santhoshkumar Mahadevan**, Alok PS Chauhan “Investigating effect of crystalline carbon with polyol synthesized pure copper at elevated temperature” National Conference on Microscopy & Advances in Material Science (NCMAMS-2015), March 02- 04, 2015, Jammu University, Jammu, (**Poster presentation**).
- **Santhoshkumar Mahadevan**, Alok PS Chauhan “Preparation and characterization of fine copper nanoparticles” Nation Conference on Recent Advances in Chemical and Materials Science (NCRACMS-15), February 23-24 2015, Madan Mohan Malaviya University of Technology, Gorakhpur, (**Oral presentation**).

2. Workshop and Seminar

- “Two days webinar on MIMO antennas for 5G communications using CST studio suite” Department of electronic science, University of Delhi (South campus), New Delhi, June 5 - 6, 2020. (Online)

- “Summer School on Magnetism (SSM-2016)” organized by School of Physics & Materials Science, Thapar Institute of Engineering & Technology, Patiala July 11-15, 2016.
- “National Workshop on Advanced Techniques for surface characterization” organized by School of Physics & Materials Science, Thapar Institute of Engineering & Technology, Patiala, October 28-30, 2015.
- “Bringing the Nanoworld Together by Oxford Instrument”, Indian Institute of Technology, Delhi, 2014.
- “Synthesis and Characterization of Smart Material”, Sri Ram Engineering College, Chennai, 2011.

Reference

1. **Dr. Puneet Sharma**, Professor (Doctorate supervisor),
Incharge – Magnetic materials Lab,
G252, School of Physics & Materials Science,
Thapar Institute of Engineering & Technology, Patiala (Pb), India-147004.
puneet.sharma@thapar.edu
2. **Dr. Bhupendrakumar Chudasama**, Professor (Doctoral committee member),
Incharge – Nano magnetic lab,
School of Physics & Materials Science,
Thapar Institute of Engineering & Technology, Patiala (Pb), India-147004.
bnchudasama@thapar.edu
3. **Dr. Bhaskar Chandra Mohanty**, Associate Professor (Doctoral committee member),
Incharge – Thin film Lab, School of Physics & Materials Science,
Thapar Institute of Engineering & Technology, Patiala (Pb), India-147004.
bhaskar@thapar.edu

Activities and Societies:

1. Life Member of Material Research Society of India (MRSI).
2. Life Member of Magnetic Society of India (MSI).
3. IEEE student member Delhi chapter (2019-2020).

Linguistic Ability:

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| 1. Tamil | : | Native or bilingual proficiency. |
| 2. English | : | Full professional proficiency. |
| 3. Hindi | : | Limited working proficiency. |

Personal Interest:

1. Reading books. 2. Astrophotography.

Personal Details:

Name : Santhoshkumar M
Date of Birth : September 27, 1991
Gender : Male
Marital Status : Married
Nationality : Indian
Spouse Name : Ratchakambal Santhoshkumar
Permanent Address : S/o R. Mahadevan, 1/17a, Vellaler Street,
Vallam village, Mathur post, Kancheepuram (Dt), 602105.

Declaration:

I hereby declare that all the details furnished above are true to the best of my knowledge and belief.

(Santhoshkumar M)

Date : April 30, 2022

Place : Patiala