

Master Thesis Topic

Exploring Ferrimagnetic Materials for Future Memory Technologies

About the Project:

Ferrimagnetic spintronics combines the advantages of ferromagnetic and antiferromagnetic materials and has become a highly promising research field in modern condensed-matter physics. In particular, ferrimagnets offer exciting opportunities for next-generation data storage technologies, enabling ultrafast operation and ultrahigh storage density.

In this project, the student will explore the ferrimagnetic material NiCo_2O_4 (NCO), which exhibits strong perpendicular magnetic anisotropy at room temperature. The main objective is to synthesize high-quality thin films using molecular beam epitaxy (MBE) and investigate their structural, magnetic and transport properties.

Your Mission:

- Optimize growth parameters for high-quality NCO thin films using MBE
- Characterize crystal structure using X-ray diffraction (XRD) and X-ray reflectivity (XRR)
- Investigate magnetic properties using superconducting quantum interference device (SQUID) magnetometry
- Study spin transport properties using anomalous Hall effect measurements

Expected Outcomes:

- Development of high-quality NCO films for ferrimagnetic spintronic applications
- Understanding the correlation between structural, magnetic, and spin transport properties

Skills You Will Build:

- Hands-on expertise in thin-film growth
- X-ray-related techniques to investigate crystal structures
- Practical skills in magnetic and spin transport measurements, including data analysis
- Experience in scientific writing and contributing to peer-reviewed publications
- Critical thinking and problem-solving in experimental condensed-matter physics

Your Profile:

- Background in solid state physics, or a related field.
- Interest in magnetism and magnetic materials.
- High motivation, excellent interpersonal and project management skills.

Opportunities and Benefits:

- Modern laboratories with a wide range of experimental techniques
- Supportive environment with experts for various scientific sub-fields
- International and culturally diverse community
- Location in the heart of Berlin with excellent public transport connections
- Possibility to participate in professional development programs.

For further information regarding the project, please **contact**:

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