

The 4th Japan-Turkey Collaborative Symposium on Magnetism (JTSM)

- Date -

August 14-15, 2025

- Place -

Tohoku University, Sendai, Miyagi, Japan

- Organizer -

Mehmet C. Onbasli (Koc University),
Taichi Goto (Tohoku University)

Program

August 14

15:30-15:45

A01

"BST Growth and Characterization"

Ebrahim Zahrabi (PhD Student, KU)

We used molecular beam epitaxy for epitaxial growth of Sb-doped Bi_2Te_3 films on sapphire substrates and used x-ray diffraction ($\omega - 2\theta$ coupled scan, reciprocal space maps, pole figures, x-ray reflectometry, lattice parameter analysis), x-ray photoelectron spectroscopy, Raman spectroscopy and DFT analysis to elucidate the Fermi level tuning, lattice strain evolution and chiral phonon formation. Unique Raman signatures of surface and bulk chiral phonons emerged in DFT. Experimental Raman analysis confirmed these DFT predictions.

15:45-16:00

A02

"DFT-Based Prediction of Rashba Splitting in BST"

Roya Kavkhani (PhD Student, KU)

We systematically studied Sb-doped Bi_2Te_3 and Bi_2Se_3 thin films using density functional theory to elucidate how Sb concentration modulates topological surface states, Rashba spin splitting, and transport properties. Pronounced Rashba-type splitting with helical spin textures emerges in Bi_2Te_3 at $x = 0.5-0.9$, peaking at $x = 0.6$ with a Rashba parameter of $2.098 \text{ eV}\cdot\text{\AA}$. Band inversion persists across all doping levels, and surface electron mobilities increase significantly compared to bulk values, consistent with experimental trends. These findings position $(\text{Bi}_{1-x}\text{Sb}_x)_2\text{Te}_3$ and $(\text{Bi}_{1-x}\text{Sb}_x)_2\text{Se}_3$ as promising platforms for spintronic and quantum technologies.

16:00-16:15

A03

"Mn-doped BiFeO_3 DFT Calculations"

Berna Akgenç (Post-doc, KU), Can Çoruh (Intern, KU)

We investigated the structural, electronic and magnetic properties of pristine and Mn-doped BiFeO_3 for magnetooptical spatial light modulator (MO SLM) applications. Bismuth ferrite is a ferroelectric perovskite oxide and manganese doping helps obtain magnetization in the ferroelectric layer, leading to multiferroicity. In this DFT study, we explored the different calculation methods for band gap estimation and identified the origin of magnetism as both magnetic substitution ion and oxygen vacancies. These characteristics could enable voltage control of magnetism in a ferroelectric oxide with a wide band gap, which is ideal for low power MO SLMs.

16:15-16:30

A04

“Quantum Emitters in h-BN (Experimental and DFT)”

Kerem Anar (PhD Student, Koc University)

We investigated the photoluminescence properties of eight C- and Si-doped point defects in hexagonal boron nitride using density functional theory and experimentally. C-based defects without vacancies exhibit sharp near-infrared zero-phonon lines and low electron-phonon coupling, while Si-based defects show strong phonon sidebands unless vacancies are introduced, which reduces coupling and induces magnetism. These results identify defect configurations with stable magnetic and optical signatures suitable for quantum photonic and spintronic applications.

16:30-18:00

A05

“Demonstration of Room-temperature Skyrmions along Magnetic Insulator/Topological Insulator/Magnetic Insulator Trilayer Interfaces for Ultralow Energy Spintronics”

Mehmet Onbasli (Associate Professor, KU)

We report the first room-temperature, zero-field observation of stable skyrmion-hopfion spin textures in EuS–Bi₂Se₃–EuS trilayers. Combining Lorentz TEM imaging and micromagnetic modeling, we unveil how interfacial Dzyaloshinskii–Moriya interaction and geometric confinement stabilize these multidimensional topological states. These findings offer a pathway toward ultralow-power spintronic devices harnessing robust, chiral magnetism in engineered topological heterostructures. We discuss skyrmion logic gate designs and compare them with their microelectronic counterparts for future potential device progress.

19:00-21:00

Discussion with Dinner



August 15

10:00-10:30

B01

"Thickness dependence of Ce:YIG film growth analyzed by radiation facilities"

Taichi Goto (Associate Professor, TU)

Various thickness Ce-substituted yttrium iron garnet films were epitaxially grown on garnet substrates. The anisotropy of these films was changed and large magnetic domain states were observed. The Hall resistivity was characterized and will be discussed at the symposium.

10:30-10:45

B02

"Improved Micromagnetic Simulation of Magnetic Garnet Films: Achieving Better Agreement with Experimental Hysteresis Loops"

Takumi Koguchi (PhD Student, TU)

We have been working toward fitting magnetic hysteresis loops using micromagnetic simulations of magnetic garnet films. However, the current situation is that the calculated coercivity and remanent magnetization are larger than those observed experimentally. This time, we have improved this issue and will report on our findings.

10:45-11:00

B03

"Development of Magneto-Optical Holographic Lens: Focusing and Modulation Demonstrations"

Hibiki Miyashita (PhD Student, TU)

We are developing lens applications using magneto-optical effects and aiming to demonstrate their functionality. We will discuss the focusing capabilities using the lens and its modulation operations.