

MAGIC⁺ WORKSHOP

Magnetism, Interactions and Complexity

Invited

Dynamics of domain wall and skyrmion in ferrimagnet

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Rare earth-3d transition metal (RE-TM) ferrimagnetic compounds, in which RE and TM magnetic moments are coupled antiferromagnetically, have two distinct compensation temperatures, namely, the magnetization compensation temperature (T_M) where the magnetizations of RE and TM sub-lattices cancel each other and the angular momentum compensation temperature (T_A) where the net angular momentum vanishes.

We found the fast field-driven domain wall (DW) motion in ferrimagnetic GdFeCo at T_A [1]. The collective coordinate approach generalized for ferrimagnets and atomistic spin model simulations show that this remarkable enhancement of DW velocity is a consequence of antiferromagnetic spin dynamics at T_A . The antiferromagnetic spin dynamics at T_A results in a peculiar phenomenon; vanishing the skyrmion Hall effect at T_A [2]. We also examined the effect of spin-transfer torque on the motion of DW ferrimagnets and found that adiabatic spin transfer torque changes its sign at T_A and non-adiabatic spin transfer torque shows a peak at T_A [3]. We also found bulk Dzyaloshinskii-Moriya interaction (DMI) in amorphous GdFeCo. This bulk DMI is attributed to an asymmetric distribution of elemental content in the GdFeCo layer, where spatial inversion symmetry is broken throughout the layer [4].

[1] Kab-Jin Kim et al., *Nature Materials* 16, 1187 (2017).

[2] Yuushou Hirata et al., *Nature Nanotechnology* 14, 232 (2019).

[3] Takaya Okuno et al., *Nature Electronics* 2, 389 (2019).

[4] Duck-Ho Kim et al., *Nature Materials* 18, 685 (2019).

Acknowledgements: This work was partly supported by JSPS KAKENHI Grant Numbers 15H05702, 26870300, 26870304, 26103002, 25220604, 2604316, Collaborative Research Program of the Institute for Chemical Research, Kyoto University, and Cooperative Research Project Program of the Research Institute of Electrical Communication, Tohoku University.