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**Theoretical study of interacting skyrmions in bilayer systems**
WATARU KOSHIBAE, NAOTO NAGAOSA, RIKEN Center for Emergent Matter Science (CEMS) — Magnetic skyrmion behaves as an emergent particle serving as an ideal laboratory to study "particle" in field theory, and also has large potentiality for applications to memory devices. Due to the recent advances on the skyrmions in multilayer system with interfaces, the skyrmions interacting along the direction perpendicular to the plane become realistic. As a most fundamental model of this issue, here we study the two skyrmions on different two-dimensional Dzyaloshinskii-Moriya (DM) magnets, i.e., bilayer system. The skyrmions show rich and complex dynamics depending on the sign of the interlayer exchange interaction and also the relative signs of the DM interactions on two layers. Especially, the collision dynamics and the bound state formation are revealed. In the case of ferromagnetic interlayer exchange interaction, the two skyrmions sometimes shows the rotating motion around each other, the direction of which can change, and eventually form the bound state or are detached depending on the strength of the current flow driving the skyrmion. In the case of antiferromagnetic interlayer interaction, they shows the parallel motion and the velocity is enhanced when the bound state is formed. Based on this result, we propose a new colossal spin-transfer-torque device.

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