

Abstract Submitted
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Dzyaloshinki-Moriya interaction mediated by combined exchange and Rashba bands¹ ANIRBAN KUNDU, SHUFENG ZHANG, Univ of Arizona — Domain wall structure determined by the competition among exchange, anisotropy, and magnetostatics does not have a preferred wall chirality, i.e., the clockwise and anti-clockwise spin rotations of the domain wall are equally probable. Dzyaloshinskii-Moriya interaction (DMI) has been identified as the dominant mechanism for the observed chiral domain walls in ultrathin ferromagnetic CoNi films.² We show that the DMI arises from the interplay between the ferromagnetic exchange coupling and the interface Rashba spin-orbit coupling; these two couplings generally exists for ultrathin films with perpendicular magnetic anisotropy. The DMI displays an oscillatory dependence on the distance of two magnetic ions. In the limit that the Rashba coupling is much smaller than the exchange coupling, the strength of the DMI is linear with respect to the Rashba coupling. In the opposite limit, the DMI depends on the quadratic Rashba coupling. We apply our results to study the chiral dependence of the domain walls. In particular, we quantitatively relate the Rashba coupling strength to the wall structure and map out the preferred Neel or Bloch walls with definite chirality. The results agree with the experiment.³

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²Gong Chen *et al.*, Nature Communication **4**, 2671 (2013).

³Chen *et al.*

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