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Chirality evaluation of spin spiral in Mn thin film on W(110)
MASAHIRO HAZE, YASUO YOSHIDA, YUKIO HASEGAWA, The Institute for Solid State Physics, The University of Tokyo — In crystal fields with broken inversion symmetry such as surfaces or interfaces, the Dzyaloshinskii-Moriya interaction (DMI), which is induced by the spin orbit interaction, may have a significant contribution to the formation of spin structures. Because of DMI, magnetic thin films formed on a heavy-elemental substrate such as W often exhibit peculiar spin spiral structures whose chirality is fixed and determined by the polarity of DMI. Investigating the chirality of spin structures is thus important to reveal the formation mechanism of spin structures and, more specifically, to determine whether DMI plays a decisive role on it. Monolayer (ML) Mn thin films formed on W(110), the first surface spin spiral structures, show a cycloidal spin spiral structure propagating along to [1-10] axis. Spin-polarized scanning tunneling microscopy (SP-STM) and theoretical analysis based on density functional calculation revealed left-handed chirality of the structure and concluded that it is driven by DMI. A SP-STM recent study revealed that double layer (DL) Mn thin films on W(110) show a conical spin spiral structure whose propagation direction is along [001]. The chirality and its driving interaction, however, have not been revealed yet. Here in this study, we have investigated the chirality of DL Mn by SP-STM. Our experimental results revealed that the spin spiral structure of DL Mn is homochiral but right-handed, which is opposite to that of ML Mn. In the presentation we will discuss different roles of DMI exerted on the two Mn thin films.

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