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Unconventional Magnetic Domains in Triple-layered $Sr_4Ru_3O_{10}^{-1}$ KAI DU, SEONG JOON LIM, JAE WOOK KIM, Rutgers Univ, GANG CAO, University of Kentucky, SANG WOOK CHEONG, Rutgers Univ, RUTGERS CENTER FOR EMERGENT MATERIAL TEAM, CENTER FOR ADVANCED MATERI-ALS, UNIVERSITY OF KENTUCKY COLLABORATION — A plethora of fascinating phenomena including p-wave superconductivity in Sr_2RuO_4 (n=1) and hybrid improper ferroelectricity in $Ca_3Ru_2O_7$ (n=2) have been observed in Ruddlesden-Popper ruthenates (Ca, Sr)_{n+1} Ru_nO_{3n+1} . The triple-layered $Sr_4Ru_3O_{10}$ (n=3) is believed to have an intriguing complex magnetic state, compared with its neighboring bi-layered meta-magnetic $Sr_3Ru_2O_7(n=2)$ and ferromagnetic $SrRuO_3$ $(n=\infty)$. The phase competition nature associated with this complexity is considered to be responsible for its novel properties such as coupled anisotropic magnetism and transport, low frequency quantum oscillations and sharp magneto-resistivity steps, which are still not well understood yet. To better understand its microscopic mechanism, we studied the magnetic domain structure on $Sr_4Ru_3O_{10}$ using low-temperature magnetic force microscopy. The observed unique domain structures in $Sr_4Ru_3O_{10}$ may shed lights on its microscopic phase competition nature and lead to a deeper understanding on its relations with other layered ruthenates.

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