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Magnetic-field control of topological charge-transport properties in $Nd_2Ir_2O_7$ KENTARO UEDA, Department of Applied Physics and Quantum-Phase Electronics Center (QPEC), University of Tokyo, BOHM-JUNG YANG, RIKEN Center for Emergent Matter Science (CEMS), JUN FUJIOKA, Department of Applied Physics and Quantum-Phase Electronics Center (QPEC), University of Tokyo, JUNICHI SHIOGAI, ATSUSHI TSUKAZAKI, Institute for Materials Research, Tohoku University, NAOTO NAGAOSA, YOSHINORI TOKURA, Department of Applied Physics and Quantum-Phase Electronics Center (QPEC), University of Tokyo — Weyl semimetal is a novel quantum phase with topological properties where the linear-dispersive band with a surface Fermi arc state is realized in a three-dimensional bulk. Pyrochlore-type $R_2Ir_2O_7$ is one of the promising candidates for realization of the Weyl semimetal. In this system, the magnetic ordering pattern is predicted to play a key role for characterizing its electronic band structure. We report the magneto-transport properties in $Nd_2Ir_2O_7$ single crystals for several magnetic field directions. We reveal that all-in all-out type magnetic domain walls, at which the conductive mode inherent to the surface state of Weyl semimetal may be preserved, are finely controlled by an applied field along [111] direction showing unique hysteresis in resistivity. With applied field along [001] direction, the Nd-4f moment forms 2-in 2-out configuration that turns the insulating state into the anomalous metallic one near the Weyl (semi-)metal phase. A mean-field calculation consistent with our experimental findings suggests that there are a plenty of exotic states in pyrochlore iridates as functions of electron correlation and external magnetic field that tunes Ir-5d spin texture.

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