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Experimental studies of structure-property relationship in nine- and four-layer $BaRuO_3$ YIQUN YING, Pennsylvania State University, TAO HE, ROBERT CAVA, Princeton University, YING LIU, Pennsylvania State University — $BaRuO_3$ is a fascinating material as it possesses four different crystalline forms that possess rather different physical properties. We report results of our low-temperature magnetotransport measurements on single crystals of nine-layer rhombohedra (9R) and four-layer hexagonal (4H) $BaRuO_3$, two of the four different crystalline structures adopted by this material. Structurally a very short Ru-Ru distance was found in both 4H and 9R $BaRuO_3$, leading to metal-metal bonding, while 9R $BaRuO_3$ features three but 4H $BaRuO_3$ two face-sharing RuO_6 octahedra. For both 9R and 4H $BaRuO_3$, the magnetoresistance was found to become significant only below 30 K. More importantly, the magnetoresistance of 9R $BaRuO_3$ was found to be negative, while that of 4H $BaRuO_3$ positive. We suggest that the difference in the sign of magnetoresistance is associated with the difference in the two crystalline forms and electronic states of $BaRuO_3$, with only 9R $BaRuO_3$ featuring the previously proposed energy gap on certain part of the Fermi surface. Specific heat measurements are also being pursued to seek for additional insight into the physics of $BaRuO_3$. The work is supported by DOD ARO and NSF.

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