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New results from experimental studies of single-crystal quantum structures of spin-triplet superconductor Sr_2RuO_4 XINXIN CAI, BRAIN ZAKRZEWSKI, SHAUN MILLS, YIQUN YING, Pennsylvania State Univ, ZONGLI WANG, Zhejiang Univ, LIBIN WEN, SHUN WANG, Shanghai Jiao Tong Univ, DAVID FOBES, TIJIANG LIU, ZHIQIANG MAO, Tulane Univ, YING LIU, Pennsylvania State Univ — Sr_2RuO_4, the only layered perovskite that becomes superconducting without the presence of Cu, was predicted to be an odd-parity, spin-triplet (possibly chiral p-wave) superconductor shortly after the discovery of its superconductivity. This prediction was supported by intensive work in the past two decades. Our experimental studies of Sr_2RuO_4 aim at detecting novel topological objects predicted for this superconducting material, including chiral edge currents, domains and domain walls, half-quantum vortices, and others. We established a process to prepare single-crystal quantum structures of Sr_2RuO_4 starting from mechanically exfoliated thin flakes. We identified Ru-free flakes of Sr_2RuO_4 showing enhanced superconductivity and demonstrated the link between the local enhancement of T_c and the presence of edge dislocations due to symmetry lowering. We fabricated mesoscopic superconducting rings of Sr_2RuO_4 and carried out Little-Parks resistance oscillation measurements, finding anomalously large resistance oscillations of full-flux period. With the application of an in-plane field and a large measurement current, the emergence of a second set of resistance oscillations was observed that suggested the existence of half-flux L-P resistance oscillations. Further experimental issues need to be clarified before the half-flux L-P resistance oscillations are fully established.

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