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Planar junction tunneling study of single-crystal eutectic phases of $\text{Sr}_2\text{RuO}_4/\text{Sr}_3\text{Ru}_2\text{O}_7$ XINXIN CAI, BRIAN ZAKRZEWSKI, Pennsylvania State University, H. WANG, Zhejiang University, C. ANDREOU, Pennsylvania State University, D. SCHLOM, Cornell University, Z.-Q. MAO, Tulane University, R. J. CAVA, Princeton University, YING LIU, Pennsylvania State University, Shanghai Jiao Tong University — Despite of intensive study of many years, the precise value of the superconducting energy gap of the odd-parity superconductor Sr_2RuO_4 has not been fully settled. Many complications exist. The band dependence of superconductivity makes the results from a bulk measurement of the gap difficult to interpret quantitatively. Surface based measurements such as scanning tunneling spectroscopy have to deal with the suppression of the superconducting energy gap on the cleaved *ab* surface due to surface reconstruction. We performed quasi-particle tunneling measurements of the superconducting energy gap in planar junctions prepared on naturally cleaved edges of a Sr_2RuO_4 crystal found in the eutectic phase of $\text{Sr}_2\text{RuO}_4/\text{Sr}_3\text{Ru}_2\text{O}_7$. Cleaving of such eutectic crystals exposes thin Sr_2RuO_4 plates inserted in a $\text{Sr}_3\text{Ru}_2\text{O}_7$ bulk crystal with the *c* axis along that of the $\text{Sr}_3\text{Ru}_2\text{O}_7$ bulk, as shown by X-ray diffraction data. Results obtained on Au- $\text{Sr}_2\text{RuO}_4/\text{Sr}_3\text{Ru}_2\text{O}_7$ tunnel junctions suggest that superconductivity survives on the surface of the plates, showing a gap value of ~ 0.2 meV, close to the BCS value for weak-coupling superconductors. Experiments on tunnel junctions made on cleaved crystals of a mesoscopic size are underway.

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