Measurements of superconducting energy gap in individual Ru islands embedded in $\text{Sr}_2\text{RuO}_4$ YIQUN YING, B. CLOUSER, R. MYERS, N. STALEY, YING LIU, Pennsylvania State University, D. FOBES, Z.Q. MAO, Tulane University, Y. XIN, Florida State University, L. ALLARD, Oak Ridge National Laboratory — We report our tunneling measurements on individual single-crystalline Ru islands embedded in a bulk $\text{Sr}_2\text{RuO}_4$ single crystal. Tunneling junctions were prepared on large (micron size) and small (submicron size) Ru islands by fabricating tunneling windows using quartz filaments as shadow masks. Our measurements revealed the presence of an energy gap below a temperature close to the $T_c$ of bulk Ru. In the zero temperature limit, the gap was found to be 0.07 meV for large Ru islands, consistent with our measurements on bulk polycrystalline Ru. However, in small Ru islands a gap of 0.1 meV, clearly larger than that seen in large Ru islands, was observed. The difference in energy gap may reflect difference in pairing state in Ru islands of different sizes. Above the $T_c$ of Ru but below the $T_c$ of $\text{Sr}_2\text{RuO}_4$, we detected no proximity induced energy gap. This observation is unexpected as our Z-contrasted transmission electron microscope study showed that the interface between a Ru island and $\text{Sr}_2\text{RuO}_4$ is atomically sharp, which appears to rule out the suppression of the proximity effect by disorder. We argue that these observations are associated with chiral p-wave superconductivity in $\text{Sr}_2\text{RuO}_4$.

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