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Measurement of the Mott insulating gap in $Ca_3Ru_2O_7$by tunneling spectroscopy ANTHONY BAUTISTA, V. DURAIRAJ, S. CHIKARA, G. CAO, K.-W. NG, University of Kentucky — The bilayered $Ca_3Ru_2O_7$ adopts an orthorhombic structure with the tilting and rotation of RuO6 octahdera in the basal plane. It is thus highly anisotropic magnetically and electronically. The extensive d-electron orbitals generate strong coupling between spin-orbit and lattice, resulting in an exotic ground state and lead to interesting properties at low temperatures. For instance, it undergoes a transition from a paramagnetic metallic state to an antiferromagnetic metallic state as the temperature is lowered to 56K, and subsequently another transition, a Mott transition, at a lower temperature of 48K. We have prepared $Ca_3Ru_2O_7/Al_2O_3/Ag$ tunnel junctions to measure the density of states of $Ca_3Ru_2O_7$ at low temperatures. The Mott insulating gap is determined to be $\sim$0.07eV when it first opens up at 48K, but the gap continues to grow with decreasing temperature. In some junctions, the density of states displays unusual activities in the temperature range of the antiferromagnetic metallic state, between 48K and 56K. Results of this study, in particular the temperature dependence of the gap structure in the density of states will be presented and discussed.

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