Probing the isotropic superconducting gap in high-entropy-alloy via quasi-particle scattering spectroscopy

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Even though the intriguing features of superconducting (SC) nature in high-entropy-alloy superconductor (HEAS) have attracted great interests, its SC pairing symmetry has not been identified. Here, we report the SC energy gap (Δ) of the HEAS $Ta_{1/6}Nb_{2/6}Hf_{1/6}Zr_{1/6}Ti_{1/6}$ probed by using quasi-particle scattering spectroscopy. The signature of Andreev reflection is observed in the differential conductance (d*I*/d*V*) spectra below the SC transition temperature (T_c) of 7.85 K, which was reasonably explained by the modified Blonder-Tinkham-Klapwijk (BTK) model. The evolution of the Δ as a function of temperature and magnetic field follows the BCS theory with $\Delta(T=0)=1.36$ meV. The gap-to-T_c ratio, $2\Delta(0)/k_BT_c$, is 4, which is larger than the BCS prediction of 3.54, indicating that the HEAS $Ta_{1/6}Nb_{2/6}Hf_{1/6}Zr_{1/6}Ti_{1/6}$ belongs to the class of the moderate-coupled conventional superconductors.