STM/STS study of superconducting properties in Ca$_{10}$(Pt$_4$As$_8$)(Fe$_2$As$_2$)$_5$ JISUN KIM, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, HYOUNGDO NAM, Department of Physics, The University of Texas, Austin, GUORONG LI, AMAR KARKI, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, CHIH-KANG SHIH, Department of Physics, The University of Texas, Austin, JIANDI ZHANG, RONGYING JIN, E.W. PLUMMER, Department of Physics and Astronomy, Louisiana State University, Baton Rouge — Newly discovered iron-based superconductor, Ca$_{10}$(Pt$_4$As$_8$)(Fe$_2$As$_2$)$_5$ ($T_c = 34$ K) is studied using scanning tunneling microscopy/spectroscopy (STM/S). Given the symmetry of the crystal structure, several surface terminations are expected with roughly same probability: 1) Ca or partial Ca layer on top Fe$_2$As$_2$; 2) Ca or partial Ca layer on top Pt$_4$As$_8$ layer; 3) A Fe$_2$As$_2$ layer, and; 4) A Pt$_4$As$_8$ layer. Surprisingly, Fe$_2$As$_2$ related layers (1 & 3) are rarely observed (less than 1%). Instead, we observe Pt$_4$As$_8$ layers separated by unit-cell-high (~ 1 nm) steps accompanied with Ca or partial Ca layer on top Pt$_4$As$_8$ layer (1 - 2 Å step height). Scanning tunneling spectroscopy reveals different spectra for each surface, with superconducting coherence peaks seen only on Ca layers. We argue that intermediary layers are proximity-coupled to superconducting Fe$_2$As$_2$ layers. The results from Ca$_{10}$(Pt$_4$As$_8$)(Fe$_2$As$_2$)$_5$ are discussed with the properties observed in other iron-based superconductors.

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