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Magnetic, Transport Properties, Lower Critical Field, Penetration Depth, Anisotropy and Gap Evidences of Ca_{10} (Pt_nAs_8) $(Fe_{2-X}Pt_xAs_2)_5$(n = 3 And 4) Superconductors KALYAN SASMAL, YUYI XUE, PAUL C.W. CHU, Texas Center for Superconductivity, Department of Physics, University of Houston — Platinum iron arsenides $Ca_{10}(Fe_{1-x}Pt_xAs)_{10}(Pt_nAs_8)$ (n = 3 & 4) are first Fe based superconductors with metallic spacer layers. Crystal structure have stacks of Ca (Pt_nAs_8) Ca (Fe_2As_2) consists of superconducting Fe_2As_2 layers alternating with Pt_nAs_8 layers, forming a triclinic *P1*, 1038phase with $n = 3$ and tetragonal *P4/n*, 1048phase with $n = 4$. Two different negatively charged layers $[(FeAs)_{10}]^{n-}$ and $(Pt_{3+y}As_8)^{m-}$ compete for electrons provided by Ca^{2+}-ions. In parent compound $Ca_{10}(FeAs)_{10}(Pt_3As_8)$, no excess charge dopes FeAs-layer, and superconductivity is induced by Pt-substitution. Additional Pt in Pt_4As_8 layer shifts charge balance between layers and T_c raises to 38 K, but decreases again if additionally Pt is substituted for Fe. Charge doping is supported by $T_c \approx 30$ K in electron-doped La-1038, x = 0:2 $(Ca_{1-x}La_x)_{10}(Pt_3As_8)(Fe_2As_2)_5$ without significant Pt-substitution. Magnetic properties were explored. Magnetization measurements reveal fish-tail hysteresis loop and relatively high critical current density at low T. Lower critical field,H_{c1} deduced from vortex penetration into single crystals. Ginsburg-Lauder parameters extracted from reversible magnetizations data. Upper critical field determined by resistive transition shows large anisotropy. With La doping, the structural/magnetic phase transitions are suppressed. T dependency of the H_{c1} is compared with BCS-gap models and anisotropy of H_{c1} will be discussed.

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