New Iron-based Perovskite-type Superconductors of $(Ca_4Al_2O_{6-y})(Fe_2Pn_2)$ and $(Ca_3Al_2O_{5-y})(Fe_2Pn_2)$ (Pn = As, P)

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Perovskite-type blocking layered iron based superconductors are one of the challenging candidates for new materials searching owing to two dimensionality in crystal structure, chemical and structural flexibility with maximum T_c reaching to 47 K. Here we demonstrate the discoveries of the $(Ca_4Al_2O_{6-y})(Fe_2Pn_2)$(Al-42622($Pn$) and $(Ca_3Al_2O_{5-y})(Fe_2Pn_2)$ Al-32522(Pn) (Pn = As, P), synthesized by high pressure technique. Al-42622(Pn) exhibits superconductivity for both Pn = As, P with the transition temperatures of 28.3 K and 17.1K, respectively. The a-lattice constants of Al-42622(Pn) (a = 3.713 Å and 3.692 Å for Pn = As and P ,respectively) are smallest among the iron-pnictide superconductors, consequently has the smallest As-Fe-As bond angle (102.1 $^\circ$). Al-32522(Pn) is the first and the unique superconductors comprised of the perovskite-based "32522" structure ever reported. Their transition temperatures (T_c) are 30.2 K (Pn = As) and 16.6 K (Pn = P), respectively. Emergence of the superconductivity is ascribed to their small tetragonal a-axis lattice constants. We demonstrate the valid existence of the strong correlation between the crystal structure and T_c, the more details on these discovering will be discussed in this conference.