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### **Iron Pnictide Superconductors: discovery and advances**

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Superconducting transition in a layered ZrCuSiAs-type crystal was first reported for LaFePO in 2006 [1] and subsequently, a similar Tc was found for LaNiPO with the same crystal structure in 2007. However, Tc of these compounds reminded low ( $\sim 4\text{K}$ ). On February 23, 2008, our paper reporting a layered compound in  $\text{LaFeAsO}_{1-x}\text{F}_x$  ( $x=0.1$ ) exhibiting a superconducting critical temperature Tc (mid-point) = 26K was published [3]. In this presentation I talk the background of this discovery and the subsequent advance in materials. The following points have been clarified to date; (1) Iron-based superconductors reported are 4-types crystal structures, the 1111[3], 122[4], 111[5], and 11 [6] type. All the high Tc iron-based superconductors contain a Fe square lattice and the Fe 3d orbitals dominate the Fermi-level. (2) The occurrence of a crystallographic transition accompanying anti-ferromagnetic to paramagnetic state in the parent compound is a requisite for a high Tc. (3) There exist a vast number of materials containing the Fe square lattice. (4). A partial substitution of Fe with other transition metal is possible without serious reduction of Tc. (4) A new insulating layer AEF (AE=Ca, Sr) was found to be effective in the 1111 phase [7]. (5) High pressure synthesis was effective to obtain the 1111 phases with higher Tc, (6) Epitaxial thin films exhibiting a Tc almost the same as that in the bulk were fabricated for  $\text{CaFeAsO}:\text{Co}$ [8]. Epitaxial thin films of LaFeAsO was recently reported as well [9].

[1] Y.Kamihara et al. JACS, **28** (2006)10012, [2] T.Watanabe et al.Inorg.Chem,**46**(2007) 7719, [3 ]Y.Kamihara et al. J.Am.Chem.Soc.**130**(2008)3296., [4]M.Rotter et al. PRL, **101**(2008) 107006, [5] J.H.Tapp et al. PRB,**78**(2008)060505 [6] F.C.Hsu et al. PNAS,**105**(2008)14262., [7] S.Matsuishi et al. JACS **130**(2008)14428 [8] H.Hiramatsu et al. Appl.Phys.Express **1**(2008)101702, [9] H.Hiramatsu et al. APL. **93**(2008) 162504.