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Iron-based superconductors and relevant materials:progress and opportunity[1]

HIDEO HOSONO, Tokyo Institute of Technology

Iron, a representative magnetic element, was believed to the last constituent for emergence of superconductivity because long range magnetic ordering competes with the formation of Cooper pair requisite for superconductivity. However, once LaFeAs(O,F) with Tc=26K was discovered, many iron-pnictide (chalcogenide) superconducting materials have been found and the maximum Tc reached 56K, which is next to the high Tc cuprates exceeding MgB_2. I think there are two significances in discovery of iron-based superconductors. First, we realized that magnetic element is not a hateful enemy but a powerful friend to realize high Tc superconductors. Second it provides a large opportunity to find new high Tc materials because there exist several hundreds of layered compounds containing square lattice of transition metal cations taking tetrahedral coordination with non-oxide anions. We expect materials with higher Tc and/or novel class of superconductors would be hidden among these. To our interest, the crystal structure of 122 is the same as that of a representative heavy fermion superconductor $CeCu_2T_2$(T=Si,Ge). One may expect some clue to bridge these two superconducting systems would be found. What we have not to forget is a historical fact that most of ground-breaking materials including high Tc superconductors have been discovered by serendipity in the course of concentrated exploration effort. I am anticipating new material functions would be discovered as a result of concentrated material exploration with a help of theoretical modeling and advanced characterization. Iron is the most important element led to leap of civilization. I hope iron would serve as the same role in the history of superconductivity. *Strike while the iron is hot.* I think this saying is still true for superconductivity research.

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