The discovery of high-temperature superconductivity in the fluoride-doped arsenide oxides $\text{REFeAs(O}_{1-x}\text{F}_x)$ ($\text{RE} =$ early rare earth element) with transition temperatures as high as 55 K has led to a true renaissance in superconductivity research. These arsenide oxides constitute a rather small fraction of a much larger family of compounds with the tetragonal ZrCuSiAs-type structure (space group $P4/nmm$), among them pnictide oxides and fluorides, chalcogenide oxides and fluorides as well as silicide and germanide hydrides. Besides the spectacular superconductivity, these materials have further interesting properties with respect to magnetic ordering, transparent semiconducting behavior or optical properties. The crystal chemical and chemical bonding peculiarities as well as the broadly varying physical properties are reviewed herein.

Key words: Pnictide Oxides, Chalcogenides, Superconductivity, Semiconductors