

Stoichiometry, Structure and Bonding in Iron Pnictide Superconductors and Related Phases

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Determining how crystal structure and chemical bonding influence the properties of solids is at the heart of collaborative research programs between materials physicists and solid state chemists. In some materials, the high T_c copper oxides and colossal magnetoresistance manganates, for example, the subtleties of how structure, bonding and properties are coupled yield an almost baffling complexity, while in others, such as many classical intermetallic superconductors, bonding and structure play a less profound role. The new superconducting pnictides appear to fall somewhere between these two limits, and have so far been the subject of relatively little study by solid state chemists. Here I will describe some of our recent work on superconductor-related “122” (ThCr_2Si_2 -type) solid solution phases as examples of the kinds of insights that structural and chemical studies can contribute to understanding these important materials.