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**Role of ruthenium in iron-based superconductors and related materials**[1] MICHAEL MCGUIRE, ATHENA SEFAT, BRAIN SALES, Oak Ridge National Laboratory — Ruthenium and iron share the same valence electron count, and form many isostructural compounds. However, the larger covalent radius and extent of the d-electrons of ruthenium lead to interesting and sometimes unexpected behavior when iron is partially or fully substituted by ruthenium. For example, "doping" layered iron compounds with ruthenium has been shown to produce superconductivity in some cases but not others, and ruthenium analogs of certain layered iron compounds do not form under similar conditions. We have investigated full and partial ruthenium substitution in several iron-based materials, including the superconducting 1111 and 122 families, and studied the effects on formation, crystal structures, and physical properties. Our new experimental findings and results from available literature will be used to discuss the unusual role that ruthenium plays in iron-based superconductors and related materials.

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