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Chemical control of the structures and properties of layered oxide chalcogenides and oxide pnictides

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Mixed anion compounds composed of oxide layers separated by chalcogenide or pnictide layers have diverse chemical, electronic and magnetic properties. The recently discovered layered iron oxide pnictides and related materials are of particular interest as they display unconventional superconductivity. In this lecture the chemical control of the composition of layered compounds in which transition metal oxide perovskite-type layers are separated by copper or silver chalcogenide layers will be described. The focus will be on the use of low temperature, "soft" chemical techniques to tune the composition. The correlations between composition, features of the crystal structures, and physical properties such as magnetic order will be described for several related systems. Comparison will be made between these layered oxide chalcogenides and analogous layered iron pnictide superconductors in which the occurrence of superconductivity is often sharply dependent on the composition.