Group-subgroup relation and superconductivity in ternary compounds with AlB_2-type structure

D. I. Walicka[1,2], F. O. von Rohr[1]*

[1]Department of Quantum Matter Physics, University of Geneva, CH-1211 Genève, Switzerland, [2] Department of Chemistry, University of Zurich, CH-8057 Zurich, Switzerland

In this work we summarize the abundance of the compounds with the AlB_2-type and related structures, which include ZrBeSi-, $CaIn_2$-, and YPtAs-type. These structures can be obtained by changing the stacking of the honeycomb layers and are connected via simple symmetry operations on the tree of the group-subgroup relations. In this class of compounds, we focus here on the ternary 111 honeycomb phases which exhibit superconductivity. Specifically, we investigate the evolution of the electronic, the superconducting and the structural properties upon exchange of the interlayer atoms in the $Ca_{1-x}Sr_xAlSi$ solid solutions. Furthermore, we present the structural phase transition in BaGaGe, where we describe a transition from 1H to 2H-BaGaGe correlated with the disorder-to-order transition of the atoms within the honeycomb layers. The structural phase transition is then followed by a transition to the superconducting state which we characterize in detail by means of magnetization, resistivity, and specific heat measurements.