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Group-subgroup relationships in ternary AlB2-type compounds and their properties

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In this work we summarize the abundance of the compounds with the AlB2-type structure and underline the importance of an in depth understanding of their structure-property relationships towards the future development of quantum materials. The simplicity of the AlB2 structure offers a vast possibility for structural tunning, where the group-subgroup relations lead to the compounds with ZrBeSi-, CaIn2- and YPtAs-type structures. These are created by changing the structural topology of the honeycomb layers and their stacking, causing the extension of the unit cell parameter along the c axis. The structural tunning has subsequent effects on the electronic properties, which can be modified by fine doping the parent compound. Here we analyze the Ca1-xSrxGaGe and the Ca1-xSrxAlSi solid solutions for the investigation of the evolution of the electronic, the superconducting and the structural properties upon exchange of the interlayer atoms.