

substance: boron compounds, general properties

property: β -tetragonal boron structure group (tetragonal II or III)

The three-dimensional framework of the β -tetragonal boron modification consists of chains of B_{12} icosahedra, which are alternately aligned in the directions of the a and b axes, and of twinned double icosahedra B_{21} linked to ten adjacent B_{12} icosahedra in these chains and to four neighbored double icosahedra. The remaining bonds are saturated by single B atoms (Fig. 1). In the related borides certain atomic sites in the double icosahedra remain unoccupied, the metal atoms are statistically distributed in interstices or they partly replace the single B atoms.

Representatives of the β -tetragonal boron structure group

Chemical formula (idealized)	Structural formula	
B (β -tetragonal modification)	$(B_{21} \cdot 2B_{12})_4(B_{2.5})_4$	
α -AlB ₁₂ (α - (Al _{3.2} B ₄₄))	$(B_{19} \cdot 2B_{12})_4Al_{13}$	87L, 77H, 77K
Al _{~1.1} Be _{~0.6} B ₂₂	$(B_{19} \cdot 2B_{12})_4B_4Al_mBe_n$	93H, 80H, 81H
Al _{1.2} Be _{0.5} B ₂₂		94W
Al _{1.0} Be _{0.97} B ₂₂		87G, 87L,
		80H,
		91D
Al _{1.44} Mg _{0.65} B ₂₂		94W
Al _x Be _y B ₂₂	$x = 1.0 \dots 1.2; y = 0.7 \dots 0.5$	87H

So far as electronic properties of representatives of the β -tetragonal boron structure group have become known, they indicate semiconducting behavior.

References:

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Fig. 1.

β -tetragonal boron structure group. **(a)** Chains of B_{12} icosahedra and **(b)** twinned B_{21} double icosahedra in the β -tetragonal boron structure. In compounds certain atomic sites in the double icosahedra remain unoccupied, the metal atoms are statistically distributed in interstices or they partly replace the single B atoms [77H, 77K].

