

**substance: boron compounds with group III elements**  
**property: properties of  $\beta$ -AlB<sub>12</sub>**

This compound is sometimes identified with Al<sub>3</sub>C<sub>2</sub>B<sub>48</sub> [87G1, 87K, 86K]. For results on this compound, see below.

**Structure**

For details of the lattice structure, see [64P]. Possibly non-metal impurity atoms are necessary to stabilize the lattice [70E].

**lattice:** orthorhombic.

**lattice parameters**

<i>a</i>	12.34 Å	<i>T</i> = 300 K		75S
<i>b</i>	12.631 Å			
<i>c</i>	10.161 Å			

Other indication of the lattice structure:

**lattice:** tetragonal [74G].

**lattice parameters**

<i>a</i>	8.82 Å	<i>T</i> = 300 K		74G
<i>c</i>	5.09 Å			

**Physical properties**

**energy gaps**

<i>E<sub>g</sub></i>	2.5 eV	<i>T</i> = 300 K	optical absorption	74G
<i>E<sub>g,th</sub></i>	2.5 eV	<i>T</i> ≥ 700 K	electrical conductivity (see Fig. 1)	76G, 79G

For lattice parameters, see above (Structure).

**IR-active phonon wavenumbers**

( <i>ν/c</i> )	450 cm <sup>-1</sup>	<i>T</i> = 300 K	optical absorption (see Fig. 2)	76G
	515 cm <sup>-1</sup>			
	570 cm <sup>-1</sup>			
	615 cm <sup>-1</sup>			
	690 cm <sup>-1</sup>			
	745 cm <sup>-1</sup>			
	810 cm <sup>-1</sup>			
	875 cm <sup>-1</sup>			
	950 cm <sup>-1</sup>			
	1030 cm <sup>-1</sup>			
	1080 cm <sup>-1</sup>			

**electrical conductivity**

<i>σ</i>	5·10 <sup>-9</sup> Ω <sup>-1</sup> cm <sup>-1</sup>	<i>T</i> = 300 K	polycrystal; see Fig. 1	76G
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**thermoelectric power**

<i>S</i>	180 μV K <sup>-1</sup>	<i>T</i> = 300 K	polycrystal; see Fig. 3	79G
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**thermal conductivity**

$\kappa$	0.2 W K <sup>-1</sup> cm <sup>-1</sup>	$T = 300$ K	polycrystalline sample; for temperature dependence, see references	74G, 79G
	0.105 W K <sup>-1</sup> cm <sup>-1</sup>	$T = 300$ K	single crystal; for temperature dependence, see reference	74G

**Debye temperature**

$\Theta_D$	1200 K			74G
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**microhardness**

$H_K$	2380 kg mm <sup>-2</sup>	$T = 300$ K	100 g load, Knoop hardness	60G
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**density**

$d$	2.60 g cm <sup>-3</sup>	$T = 300$ K	pycnometric	75S
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**melting point**

$T_m$	2214°C			60G
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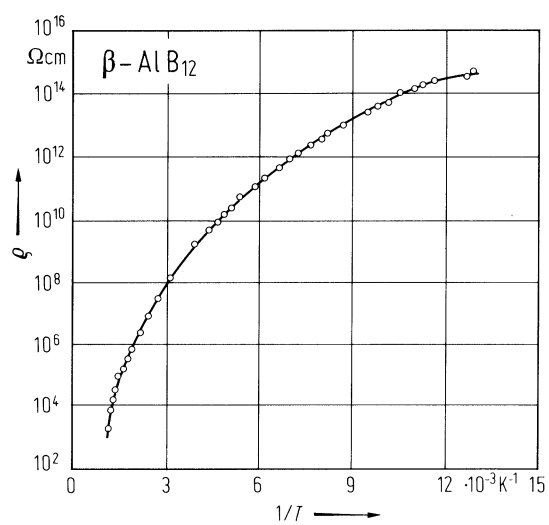
Temperature dependence of the electrical resistivity [87G1, 87G2].

## References:

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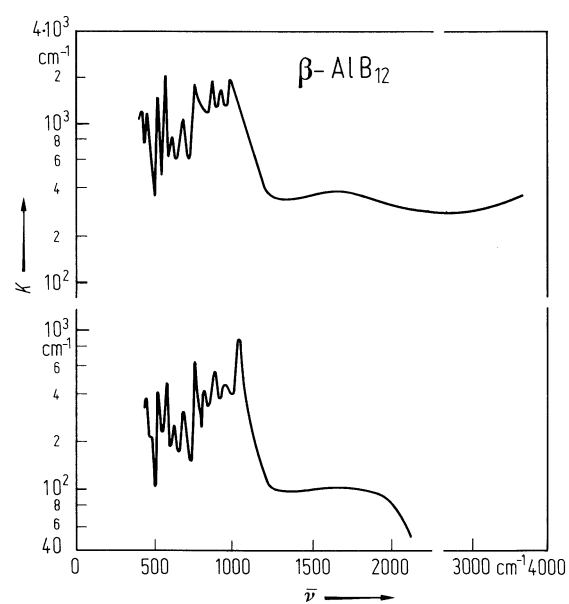
**Fig. 1.**

$\beta$ -AlB<sub>12</sub>. Electrical resistivity of polycrystalline sample vs. reciprocal temperature [76G, 79G].



**Fig. 2.**

$\beta$ -AlB<sub>12</sub>. Absorption coefficient of different samples vs. wavenumber [74G].



**Fig. 3.**

$\beta$ -AlB<sub>12</sub>. Thermoelectric power of polycrystalline sample vs. temperature [79G].

