

substance: boron compounds with group I elements
property: properties of boron-potassium compounds

KB₆

Structure

KB₆ is isostructural with CaB₆

lattice: cubic; space group: O_h¹ – Pm3m.

lattice parameter

<i>a</i>	4.232 Å	<i>T</i> = 300 K	X-ray diffraction	66N, 77N
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Physical properties

electronic structure

The calculated band structure is basically similar in topology to that of CaB₆ with the empty d orbitals of potassium forming a narrow set of bands in the accessible conduction region. The band gap (at X) is reduced by the d-orbital participation. The Fermi level (at – 8.1 eV) is very close to the lower edge of the energy gap; only a few holes are left vacant [76P, 77P].

energy gap

<i>E_g</i>	0.29 eV	<i>T</i> ≥ 300 K	electrical conductivity (see Fig. 1)	77N
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impurity and defects

Because of the high volatility of potassium deviations from stoichiometry are possible. It is assumed that beyond a limiting value the B₆-sublattice is no longer electronically stable and collapses to amorphous boron. Thus a mixture of amorphous boron and potassium deficient hexaboride is expected [77N].

conductivity

<i>σ</i>	10 ^{–4} Ω ^{–1} cm ^{–1}	<i>T</i> = 300 K	For temperature dependence, see Fig. 1	77N
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activation energy

<i>E_A</i>	0.008 eV	<i>T</i> < 120 K	electrical conductivity	77N
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magnetic susceptibility: see Fig. 2

density

<i>d</i>	2.99 g cm ^{–3}	<i>T</i> = 300 K	pycnometric	66N, 75S
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KB₅C as an electron-precise compound is described in [99A].

References:

- 66N Naslain, R., Etourneau, J.: C. R. Acad. Sci. (Paris) 263 (1966) 484.
- 75S Samsonov, G.V., Serebryakova, T.I., Neronov, V.A.: in: Boridy, Moskva Atomzidat, 1975.
- 76P Perkins, P. G., Sweeney, A. V. J.: J. Less-Common Met. 47 (1976) 165.
- 77B Berezin, A. A., Golikova, O. A., Zaitsev, V. R., Kazanin, M. M., Orlov, V. M., Tkalenko, E. N., in: Boron and Refractory Borides, (Matkovich V. 1., ed.) Springer: Berlin, Heidelberg, New York 1977, p. 52.
- 77N Naslain, R., Etourneau, J., Hagenmuller, P.: see [77B1], p. 262.
- 77P Perkins, P. G.: see [77B1], p. 31.
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Fig. 1.

KB₆. Electrical conductivity of sintered material vs. reciprocal temperature [77N].

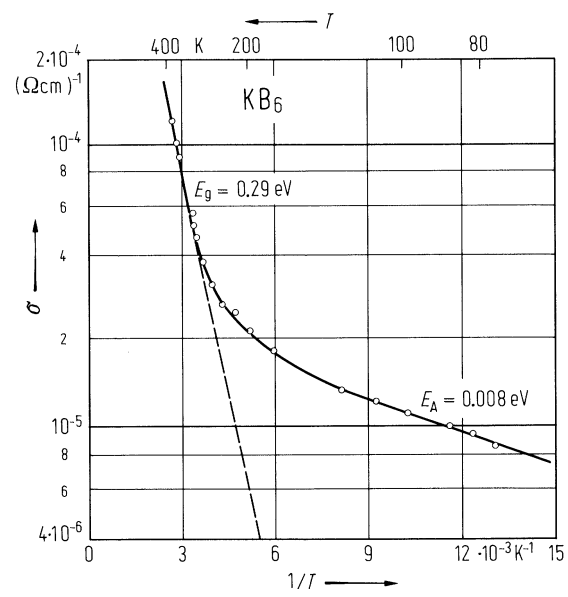


Fig. 2.

KB₆. Magnetic susceptibility χ_m vs. temperature [77N, 66N]. χ_m in CGS-emu.

