THERMAL CONDUCTIVITY OF AlN, B_4C, cBN CERAMICS

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Ability of the solid bodies to transfer heat – thermal conductivity – is the most important parameter for diagnosis of the structural state of polycrystalline and composite materials. Thermal conductivity strongly depends not only on intrinsic thermal conductivity (theoretical of single crystal) of constituting materials, but on different structural parameters as well, e.g. planar defects (contacts between grains), point defects (vacancies or mass difference of solid state solutions), i.e. of parameters determined by the technology route of the ceramics.

Recently measured at 300 K values of the thermal conductivity coefficient of the aluminum nitride, boron carbide and cubic boron nitride ceramics obtained by pressureless sintering (Fig. 1), hot pressing, and HP-HT treatment are presented and compared to the data from the Samsonov and Vinitski's book of reference [1].

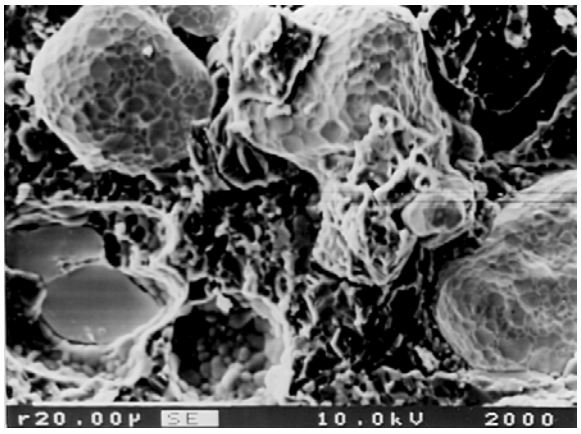

Fig. 1 Fracture surface of pressureless-sintered $AlN(Y_2O_3)$ – 38wt.% Mo composite comprising AlN matrix phase with Mo inclusions

The novel ceramic materials based on refractory compounds are characterized by thermal conductivity of 35 up to 440 W/(m·K) depending on the grain structure and nature of inclusions.

AlN	16 W/(m·K) [1]
hot-pressed	50 W/(m·K)
hot-pressed (with yttria)	90 W/(m·K)
pressureless-sintered (yttria)	140 W/(m·K)
AlN–(30-50 wt.%)Mo pressureless-sintered (yttria)	85 ч 70 W/(m·K)
AlN–(16-32 wt.%)SiC-C pressureless-sintered (yttria)	35 ч 44 W/(m·K)
AlN–(16-38 wt.%)SiC pressureless-sintered (yttria)	60 ч 80 W/(m·K)
AlN–(48-46 wt.%)SiC– –(2-4 wt.%)Mo pressureless-sintered (yttria)	54 ч 65 W/(m·K)
B_4C	46 W/(m·K) [1]
hot-pressed	32 W/(m·K)
cBN	
HPHT-sintered	220 W/(m·K)
HPHT direct hexagonal– –cubic transition	440 W/(m·K)

1. *Samsonov G. V., Vinitski I. M.* Refractory Compounds: Book of Reference. Moscow: Metallurgiya, 1976. – 560 p. (In Russian)