Electrical Conduction in Sintered SiC

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Relationship between sintering condition and electrical properties was investigated for sintered SiC. SiC powder containing boron and carbon was sintered in the temperature range of 1950°-2200°C in vacuum and cooled at 5 and 35°C/min. The electrical properties of specimens depended on the sintering temperature. The electrical conductivity of specimens sintered below 2000°C was independent of measuring temperature and applied voltage. Whereas, the conductivity of specimens sintered above 2050°C depended on the temperature and voltage. To explain these results, two electrical conduction mechanisms were proposed ; (1) current along grain boundaries which was dominant in specimens sintered below 2000°C, and (2) current across grain boundaries, which was dominant in specimens sintered above 2050°C. The effects of cooling rate on the electrical conductivity were remarkable for specimens sintered above 2050°C. Conductivity of rapidly cooled (35°C/min) specimens was higher than that of slowly cooled (5°C/min) specimens, and this effect was remarkable below room temperature. A symmetry Schottky barrier model depicting high density localized states was proposed, and cooling rate dependence of conductivity was explained in terms of difference in density of localized states.

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