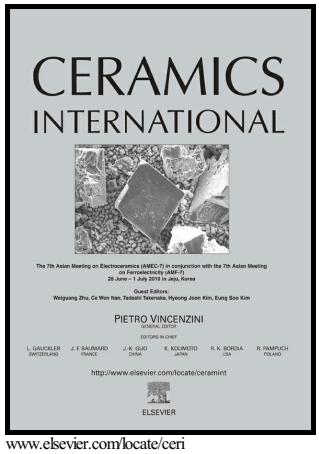

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Improved resistance to thermal fatigue of active metal brazing substrates for silicon carbide power modules using tough silicon nitrides with high thermal conductivity

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Abstract

The effect of temperature cycling from –40 to 250 °C on active metal brazing (AMB) substrates for power modules was investigated using newly developed silicon nitride ceramics with both high thermal conductivity of 140 W m^{-1} K^{-1} and superior fracture toughness of 10.5 MPa·$m^{1/2}$. Other types of AMB substrates made of AlN or Si_3N_4 were also tested for comparison. Both visual inspection and acoustic scanning microscopy (ASM) observation of the new Si_3N_4-AMB substrates after 1000 cycles revealed almost no cracks. In contrast, the Si_3N_4-AMB substrates with lower fracture toughness experienced crack initiation beneath the corner of the copper plate. The degradation in the bending strength after 1000 cycles was negligible for the new Si_3N_4-AMB substrates, whereas the

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