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A study on the sintering of fine-grained diamond-SiC composites

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ABSTRACT

Fine-grained diamond preforms (D[v, 0.9] = 2 μm) have been successfully infiltrated with silicon. The infiltration of fine-grained diamond preforms using silicon is limited by the blocking of the pores as a result of the volume increase during the reaction of diamond with Si to form SiC. The preforms were prepared using phenolic resin as a binder. In order to curb the problem of reaction chocking, the porosity of the preforms was increased by reducing the compaction pressure and the diamond particles were coated with SiC and TiC to delay the rate of reaction between diamond and silicon.

With increasing resin content, the infiltration depth increases with up to 10 wt% resin content. A maximum infiltration (from the base of the preform) of 3.31mm was achieved for the uncoated diamond with 10wt% resin content and 3.71mm was achieved for SiC-coated diamond at 10wt% resin content.

The infiltrated product is fully dense, exhibits high hardness and shows good abrasion wear properties comparable to that of Syndax.