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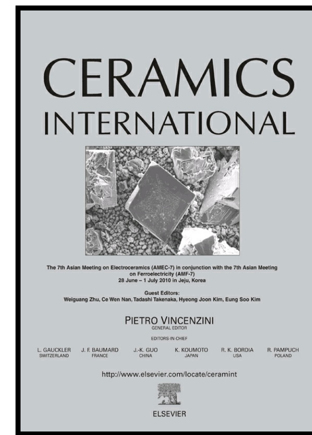

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The influence of grain geometry and wear conditions on the material removal mechanism in silicon carbide grinding with single grain

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Abstract

High efficiency and precision grinding of brittle materials is challenging due to material physical and chemical properties. To understand the effect of grain geometry and wear conditions on the material removal mechanism in brittle material precision grinding, a single diamond grain grinding experiment was conducted on Silicon Carbide (SiC). The cutting edge radius and deflection angle were measured by confocal scanning. Under six different cutting edge radius and three maximum undeformed chip thickness, grinding force and ground surface were measured. Diamond grain wear was investigated by observing the grain morphology, wear rate, grinding force, and ground surface change over accumulative material removal volume. The result showed the existence of a critical cutting edge radius for improving SiC ground surface quality. . Normal grinding force increased with the cutting edge radius increase. Tangential grinding force increased with the cutting edge radius increase and reached the peak value at the critical cutting edge radius. Flank wear was the major wear mode in precision SiC grinding. The grain wear was associated with the grinding force and ground surface.

Key words: Silicon carbide Grinding Cutting edge radius Wear

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