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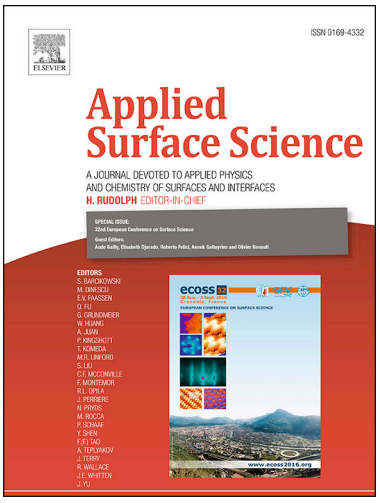

Full Length Article

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Subsurface damages beneath fracture pits of reaction-bonded silicon carbide after ultra-precision grinding

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Abstract

This paper investigated the structural defects beneath the fracture area of 6H-SiC in reaction-bonded silicon carbide (RB-SiC) ceramics after ultra-precision grinding. The nano-indentation technique was used to evaluate the evolution of deformation behavior and find the critical transition condition among elastic, plastic and fracture. It was found that beneath the fracture pits, dislocations accompanied with micro-cracks (lateral and median) were the two types of subsurface damage. However, no amorphous phase was detected. In addition, a two-beam analysis confirmed that the dislocations were activated on basal <a> and dissociated into the Shockley partial dislocations in 6H-SiC particle. The following indentation experiments revealed that the existence dislocations in the ground subsurface should be occurred earlier than cleavage. These dislocations were the predominant yielding mechanism in 6H-SiC, which initiated at a shear stress of about 23.4-28.4 Gpa through a pop-in event on load-displacement curve. Afterwards, cracks emerged when the maximum tensile stress beneath the indenter increased to 31.6