Fixed Abrasive Chemical Mechanical Polishing of SiC Wafer

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Due to Silicon Carbide (SiC) wafer excellent performance, including wide bandgap, high thermal conductivity and high breakdown field strength, it is widely used in the development of power semiconductor devices. Presently, the process flow of SiC wafers consists of four steps: rough lapping, precision lapping, rough polishing and precision polishing, which is a complex and low efficient method. Fixed abrasive chemical mechanical polishing (FA-CMP) technology was employed for polishing of SiC wafers, to replace the conventional process of fine lapping and rough polishing in a single step. The benefits are simplified procedures, a reduction in process time and an increase in efficiency. The effect of additive type and concentration in the abrasive-free slurry, as well as abrasive size and concentration in the fixed abrasive pad (FAP), on the polishing outcome were investigated. The results indicated that the surface polished with ethylene glycol (EG) exhibits no discernible scratches and attains the optimal surface quality. As the concentration of ethylene glycol increases, the material removal rate (MRR) declines, while the surface roughness Sa value initially decreases and then increases. At a concentration of 4 vol%, the MRR is 13.1 μm/h, while the surface roughness Sa is 1.6 nm. Furthermore, both the MRR and surface roughness exhibits an inverse relationship with the abrasive size, whereas they demonstrate a direct correlation with the abrasive concentration. When the abrasive size is 3-5 μm and the concentration is 125%, the surface quality of the polished SiC wafers is excellent and scratch-free, and the surface roughness Sa reaches 1.13 nm, while the MRR is 7.4 μm/h. Therefore, SiC wafer FA-CMP will significantly increase the efficiency and improve the surface quality. Thus, the efficient and high-quality processing of SiC wafers will be achieved.