A Dissolution Mechanism of the Silicon Carbide in HF/K₂Cr₂O₇ Solutions

Authors : Karima Bourenane, Aissa Keffous

Abstract : In this paper, we present an experimental method on the etching reaction of p-type 6H-SiC, etching that was carried out in HF/K₂Cr₂O₇ solutions. The morphology of the etched surface was examined with varying K₂Cr₂O₇ concentrations, etching time and temperature solution. The surfaces of the etched samples were analyzed using Scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FT-IR) and Photoluminescence. The surface morphology of samples etched in HF/K₂Cr₂O₇ is shown to depend on the solution composition and bath temperature. The investigation of the HF/K₂Cr₂O₇ solutions on 6H-SiC surface shows that as $K_2Cr_2O_7$ concentration increases, the etch rate increases to reach a maximum value at about 0.75 M and then decreases. Similar behavior has been observed when the temperature of the solution is increased. The maximum etch rate is found for 80 °C. Taking into account the result, a polishing etching solution has been developed on silicon carbide (SiC). Finally, we have proposed a dissolution mechanism of the silicon carbide in HF/K₂Cr₂O₇ solutions.

 ${\bf Keywords:} silicon\ carbide,\ dissolution,\ Chemical\ etching,\ mechanism$

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