

An experimental investigation on high-precision and damage-free processing of diamond

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Abstract : Diamond is honored as the reputation of "ultimate semiconductor material" and the surface with high-precision and damage-free is required for diamond to get the most out of its numerous excellent properties. Chemical mechanical polishing (CMP) is the primary method to obtain the surface with high-precision and damage-free. However, it is difficult for diamond to be removed and oxidized on account of its properties of large hardness and stable chemical inertness. Herein, the effects of polishing parameters on the surface morphology were investigated by orthogonal experiments. The experiment results indicated that the polishing pressure and the concentrations of abrasive are the most significant parameters that determined the surface morphology of diamond. The stronger mechanical force will induce the appearance of pits and scratch on the diamond surface after polishing. However, hydroxyl radicals($\bullet\text{OH}$) has a favorable promoting effect on improving surface quality of diamond. The surface with high-precision and damage-free can be obtained under the strong mechanical action and $\bullet\text{OH}$. Finally, a new CMP technology was proposed to achieve the surface with high-precision and damage-free. This works sheds lights on the polishing technology for obtaining the diamond with high-precision and damage-free surface.
