

Orientation dependence of sapphire substrate etching processes

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The analysis of the processes of etching sapphire substrates was carried out. Features of using methods of chemical-mechanical, laser, ion, electronic etching of sapphire substrates are discussed. It was determined that during chemical-mechanical and laser etching of sapphire planes, layer-by-layer removal of material occurs through intermediate processes of intra-layer cracking, and the etching rate correlates with interplane distance. In the case of ion and electron etching, the main mechanism is the romination of permeating pores, tracks that weaken interatomic bonds and lead to the destruction of the crystal lattice of sapphire. At the same time, the etching rate of various planes of the sapphire crystal correlates with the potential energy of interatomic interaction inside the corresponding plane. The lowest intensity of the F^+ -band of cathodoluminescence, as well as the rate of oxygen vacancy genesis, is observed for the C-plane of sapphire, the atoms of the oxygen genus in which form a densely packed framework. The greatest intensity of cathodoluminescence is observed for the A-plane of sapphire, in which atoms have the least potential energy.

Keywords: orientation, sapphire, substrates, etching, cathodoluminescence.

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