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Characterization of Orientation-Dependent Etching Properties of Quartz: Application to 3-D Micromachining Simulation System

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Novel characterization results of anisotropic etching properties of single-crystal alpha-quartz for a number of orientations using a spherical specimen are reported. The dimensions of the specimen's surface were measured before and after etching, and the changes were used to calculate the etching rates for a single etching operation for a number of orientations. The etching rates were high at the Z-axis, but not the highest. Low etching rates, sometimes close to zero, were measured for directions perpendicular to the Z-axis. We first report the etching rate distribution perpendicular to the Z-axis. The estimated etching rates further allow us to simulate complete three-dimensional etching for arbitrarily oriented quartz wafers.

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