

Improvement of the machinability of silicon by multiple implantation of different ions for ultra-precision micro-cutting

Abstract

Monocrystalline materials are widely used in the semiconductor industry and optical engineering due to their excellent electrical and optical properties. However, due to the hard and brittle nature of these materials, it is difficult to achieve ultra-precise mirrors through the turning process. In this paper, a method of surface modification by multiple ion injection into silicon is proposed, and the machinability of silicon is improved by promoting the transformation from brittleness to ductility. Through simulation software, the distribution and induced displacement of implanted ions on the subsurface of the silicon wafer are visualized. The enhancement of the machinability of silicon is verified by ultra-precision micro-cutting experiments. The improvement of its subsurface was observed by TEM using FIB preparation.