Public Abstract
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X-ray Topography Techniques for the Analysis of Laser Irradiated Silicon
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There is currently much interest in femtosecond scale laser interactions with materials. Comparison of the damage produced by the femtosecond laser pulses to the longer laser pulses is also of interest. Theoretical work indicates that there should be significant differences in the damage done by the different laser pulses because of the large time scale difference in which the energy is deposited on the crystal surface. This study examined the use of X-ray topography to investigate the effects and differences in laser irradiation damage to single crystal silicon. X-ray topography provides a unique method of examining the damage produced.

Silicon wafer specimens were prepared with laser irradiated spots at different fluence levels with both nanosecond pulsed and femtosecond pulsed lasers. The specimens were designed to be examined with X-ray topography. High resolution topographs of the laser-irradiated spots on both groups of crystals were produced. The topographs were compared with the optical micrographs for feature size analysis. Damage within the irradiated region was characterized with rocking curve analysis. Analysis was also done to compare damage in the different (hkl) planes and for differentiating the type of damage done by nanosecond and femtosecond lasers.