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Laser-induced damages to sapphire single crystals PEDRO PERALTA, SHENG-NIAN LUO, Los Alamos National Lab, CHI MA, California Institute of Technology, DENNIS PAISLEY, Los Alamos National Lab — Sapphire (α-Al_2O_3), an important optical material, has often been used as a substrate or window in laser-induced shock wave loading of condensed matter. Systematic experiments were conducted to investigate its breakdown threshhold, spall and fracture, plasticity, melting and recrystallization, upon μs laser pulse illumination on the (0001) surface (wavelength of 1054 nm). One of the surfaces of the cylindrical specimen was coated with Al and graphite. The recovered samples were examined with microscopic analytic techniques. At sufficient laser fluxes, fracture was induced; the fracture patterns on the uncoated surface correlated with the spatial distribution of the driving pulse, and demonstrated three-fold symmetry as expected for the (0001) surface. Plastic deformation and solid−solid phase change were also characterized. On the coated side, the ultrafast heating and quenching yielded melting, vitrification, and nanocrystalline hexagonal and cubic phases.

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