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Microstructural relaxation phenomena on laser-modified fused silica surfaces MANYALIBO MATTHEWS, THOMAS SOULES, JAMES STOLKEN, RYAN VIGNES, STEVEN YANG, SELIM ELHADJ, Lawrence Livermore National Laboratory — Laser-driven phase transformations and associated morphological deformations on vitreous SiO_2surfaces are presented. Direct imaging of Si-O-Si asymmetric stretch transverse-optic (TO) mode shifts using a combination of scanning Infrared and Raman spectromicroscopy revealed the creation of the high pressure phase stishovite through the nonlinear absorption of ultraviolet laser pulses. Structural relaxation at ∼1900 K of modified surfaces back to the amorphous state could be correlated with Si-O bond angle shifts and used to describe the thermally-driven transformation kinetics. Kohlrausch relaxation functions are applied through finite element modeling of the calculated sub-surface thermal histories to extract reasonable values for the activation enthalpy and annealing point relaxation time of laser-modified silica. Lawrence Livermore National Laboratory is operated by Lawrence Livermore National Security, LLC, for the U.S. Department of Energy, National Nuclear Security Administration under Contract DE-AC52-07NA27344.

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