Supplementary Information

Athermal Repair Nanoscale Defects in Optical Materials Using Femtosecond Laser

Qiang Cao¹*, Jiajun Zhang¹, Jian Du², Hongming Zhao², Sheng Liu³ and Qing Peng³,⁴*

¹Laser Micro/NanoFabrication Laboratory, NanoManufacturing Fundamental Research Joint Laboratory of National Science Foundation of China, School of Mechanical Engineering, Beijing Institute of Technology, 100081, PR China

²Science and Technology on Special System Simulation Laboratory, Beijing Simulation Center, Beijing, 100854, PR China

³Nuclear Engineering and Radiological Sciences, University of Michigan, Ann Arbor, MI 48109, USA

⁴School of Power and Mechanical Engineering, Wuhan University, Wuhan, 430072, China

*Corresponding Author: caoqiang@bit.edu.cn (Qiang Cao), qpeng.org@gmail.com (Qing Peng)
1. **AFM images**

We have studied the structures of the femtosecond laser irradiated area of as-implanted fused silica using atomic force microscopy (AFM) after irradiated at different fluence. When the laser fluence is about 0.2 J/cm², the AFM images are shown in Figure S1. Compared to the image of those irradiated at the fluence of 0.5 J/cm² (Figure S2), we notice that there is no crater in the irradiated area, which means that no ablation effect happens, as preferred.

![AFM image](image.png)

**Figure S1.** The AFM image of the femtosecond laser irradiated area of as-implanted fused silica. When the laser fluence is about 0.2 J/cm², there is no crater in the
irradiated area, which means that no ablation effect happens.
Figure S2. The AFM image of the femtosecond laser irradiated area of as-implanted fused silica. When the laser fluence is above 0.5 J/cm², there is a nanoscale crater in the irradiated area.