

Highly efficient and precise processing inside transparent materials



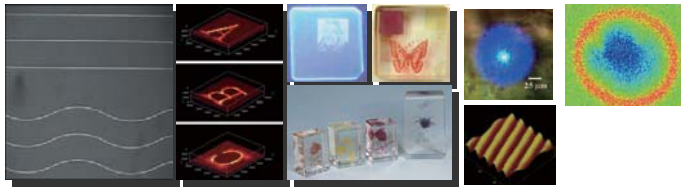
Kazuyuki HIRAO

Processing using femtosecond laser Inside transparent materials

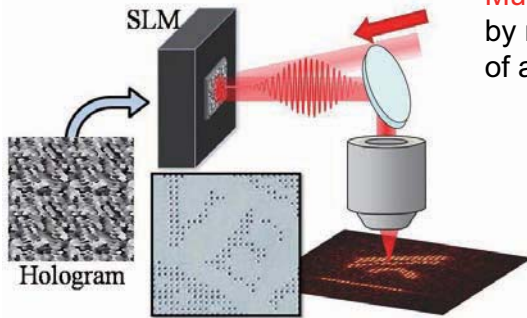


Refractive index distribution can be created inside various transparent materials with a spatial resolution of less than micrometer by focusing femtosecond laser pulses.

Optical waveguides, 3D optical data storage, space selective light emission, coloration and ion migration inside glasses.



Highly efficient laser processing with an LCOS-SLM



Multiple light spots can be generated by modulating the phase distribution of a laser pulse.

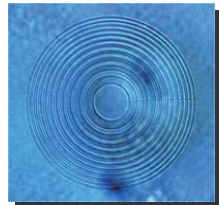


Application

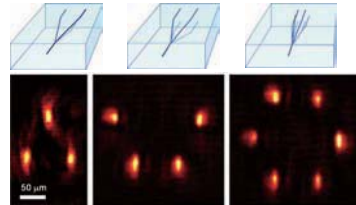
3D structure



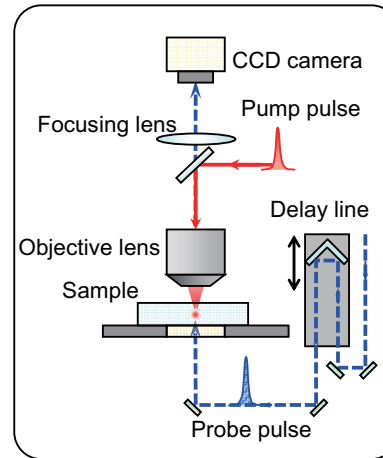
Micro optics



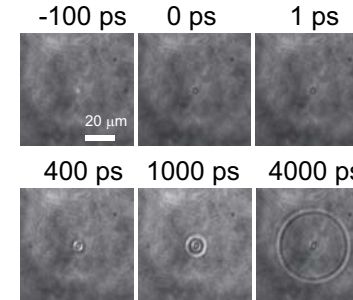
3D splitter waveguides



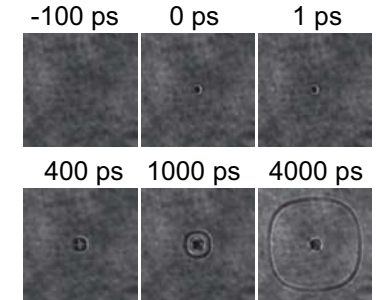
Ultrafast microscopic photograph of laser processing inside various transparent materials



Inside a glass

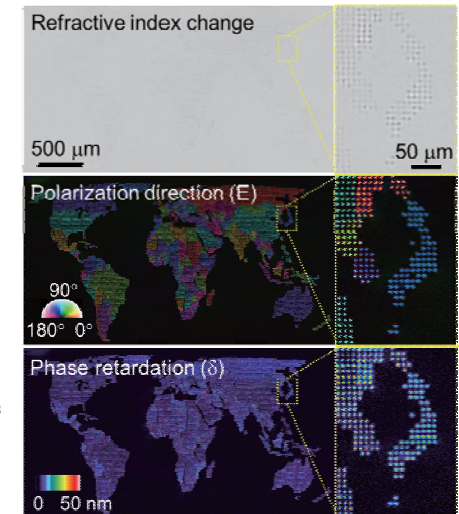
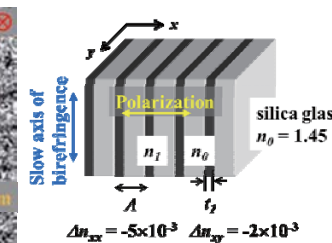
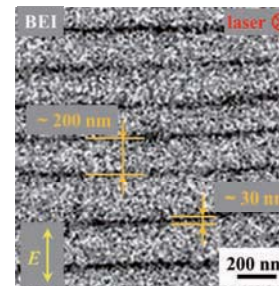
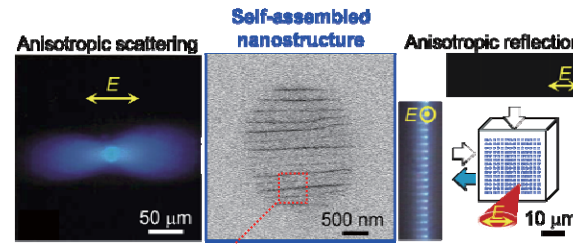


Inside a MgO crystal



Material deformation process after irradiation with a focused laser pulse can be observed with a time resolution of 10^{-13} second. With this technique, we can elucidate the origin of damage after loading external force to various solid materials.

Nanostructuring inside a glass - Nanograting



Rewritable 5D (= X + Y + Z + E + δ) optical storage with a capacity of 37 GB/cm³ corresponding to about 10 times larger than that of Blue-ray disc.