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Ablation depth control of ITO thin film using a beam shaped femtosecond laser

H. Y. Kim^{1,2}, W. S. Choi^{1,2}, Y. G. Sin^{1,2}, S. Y. Ji^{1,2}, J. W. Jeon^{1,2}, S. H. Cho^{1,2}

1- Nano Machining Laboratory, KIMM (Korea Institute of Machinery and Materials)

171 Jang-dong, Yuseong-gu, Daejeon, 305-343, Korea

2- Department of Nano-Mechatronics, UST (University of Science and Technology)

176 Gajung-dong, Yuseong-gu, Daejeon, 305-343, Korea

hykim@kimm.re.kr

Indium tin oxide (ITO) is an important transparent conducting oxide (TCO). ITO films have been widely used as transparent electrodes in optoelectronic devices such as organic light-emitting devices (OLEDs) because of their high electrical conductivity and high transmission in the visible wavelength. Finding ways to control ITO micromachining depth is important role in the fabrication and assembly of display field[1-3]. This study presented the depth control of ITO patterns on glass substrate using a femtosecond laser and slit. In the proposed approach, a Gaussian beam was transformed into a quasi-flat top beam by slit. In addition, pattern of square type shaped by slit were fabricated on the surfaces of ITO films using femtosecond laser pulse irradiation, under 1030nm, single pulse. Using femtosecond laser and slit, we selectively controlled forming depth and removed the ITO thin films with thickness 150nm on glass substrates. In particular, we observed when the 6 pulse number at 2.8TW/cm². Furthermore, the morphologies and fabricated depth were characterized using a optical microscope, atomic force microscope (AFM), and energy dispersive X-ray spectroscopy (EDS).

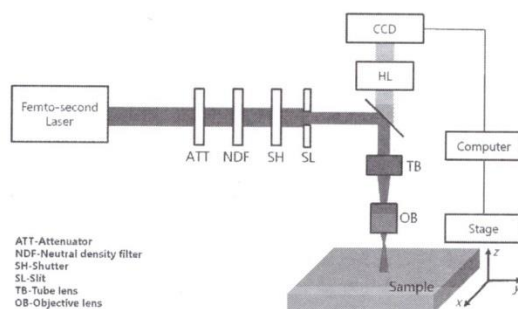


Figure 1 Schematic diagram of femtosecond laser system with slit.

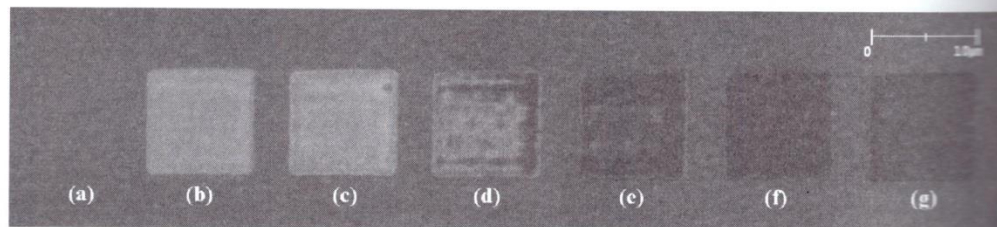


Figure 2 Optical microscopic views of morphology on ablated ITO film by NIR femtosecond laser irradiation with each different pulse shots: 0 shot (a), 1 shot (b), 2 shots (c), 3 shots (d), 4 shots (e), 5 shots (f), 6 shots (g).

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