

펨토초 레이저를 이용한 고종횡비 나노홀 가공 Fabrication of high aspect ratio hole via femtosecond laser system

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Fabrication of high aspect ratio nano holes were interested for last few decades. Because it can affect to characteristics of light, it has been applied to various photonic devices. In order to fabricate nano structures, various methods have been introduced such as focus ion beam milling, plasma etching, electron-beam lithography, and deep reactive ion etching. However, most methods need special environment. Therefore it is hard to be applied in industry. Meanwhile, femtosecond laser ablation method can be performed at normal atmosphere. But it is not easy to overcome diffraction limit. In order to fabricate nano holes, we designed optical set up based on understanding of nonlinear ionization which occurs within nanosecond after laser pulse irradiation. In this study, nano holes with aspect ratio of higher than 10 are fabricated by femtosecond laser system. Comparing with conventional laser ablation, our system can fabricate 7~10 times deeper craters in transparent materials. We also consider the compatibility of our system in industry. Since the optical path of suggested system is too complex for industrial use, we develop a fiber based optical module. A hollow core photonic crystal fiber is adopted for our optical module. With this module, we could successfully substitute our complex optical system.

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