Title

Shaped deposition via laser-induced backward transfer from a nano-structured carrier using a digital micromirror device

Abstract

Laser-induced transfer (LIT) covers a family of techniques for rapid prototyping of photonic, electronic and biomedical devices. These methods allow the fabrication of structures (voxels) involving sensitive materials, do not require a specialist environment and can even preserve the phase of a material in the final device. During LIT, the energy of a laser pulse is exploited to delaminate and eject a voxel, from of a thin film coated onto a carrier substrate, with the end goal of incidence and adhesion onto the desired receiver.

Among these methods, laser-induced backward transfer (LIBT) is a process where a transparent receiver is traversed by the incident laser pulse, and an absorptive bulk material (here: silicon) acts as carrier. The choice of a bulk carrier facilitates structuring of the interface between donor and carrier before transfer. For intact solid transfer, these structures will then be imprinted onto the resulting voxel, and our initial results have shown that feature sizes down to ~150nm are capable of surviving the LIBT process.

Here, we show our work on LIBT of transparent polymer layers via an image-projection based digital micromirror system for additional spatial structuring of voxels on the micron-scale. Experiments were carried out with the help of a 150fs pulse length, 800nm wavelength laser. We show our progress in defining the smallest surface feature sizes for carrier-imprinted voxels, leading to potential application in photonic devices.