

Fabrication and practical applications of optical metasurfaces

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The rapid progress of optical metasurfaces has enabled a wide range of applications [1]. In this talk, we will present an overview of our work on the development of optical metasurfaces and metasystems. In particular, we present the scalable fabrication of efficient visible metasurfaces, miniature beam scanning, and techniques for high-resolution 3D alignment of multiple samples using metasurfaces. We will discuss the scalable low-cost fabrication of visible metalenses using nano-imprint lithography demonstrating focusing efficiencies of 90% (Fig. 1a). As an example of an optical system enabled by metalenses, we will present a miniature laser beam scanner that scans a laser beam with nanosecond speed and 7.5mW power consumption (Fig. 1b). We will also discuss a novel technique that enables alignment of distant patterns with sub 10 nm resolution using optical metasurface (Fig. 1c). The technique has applications in registration of multilayer lithography patterns.

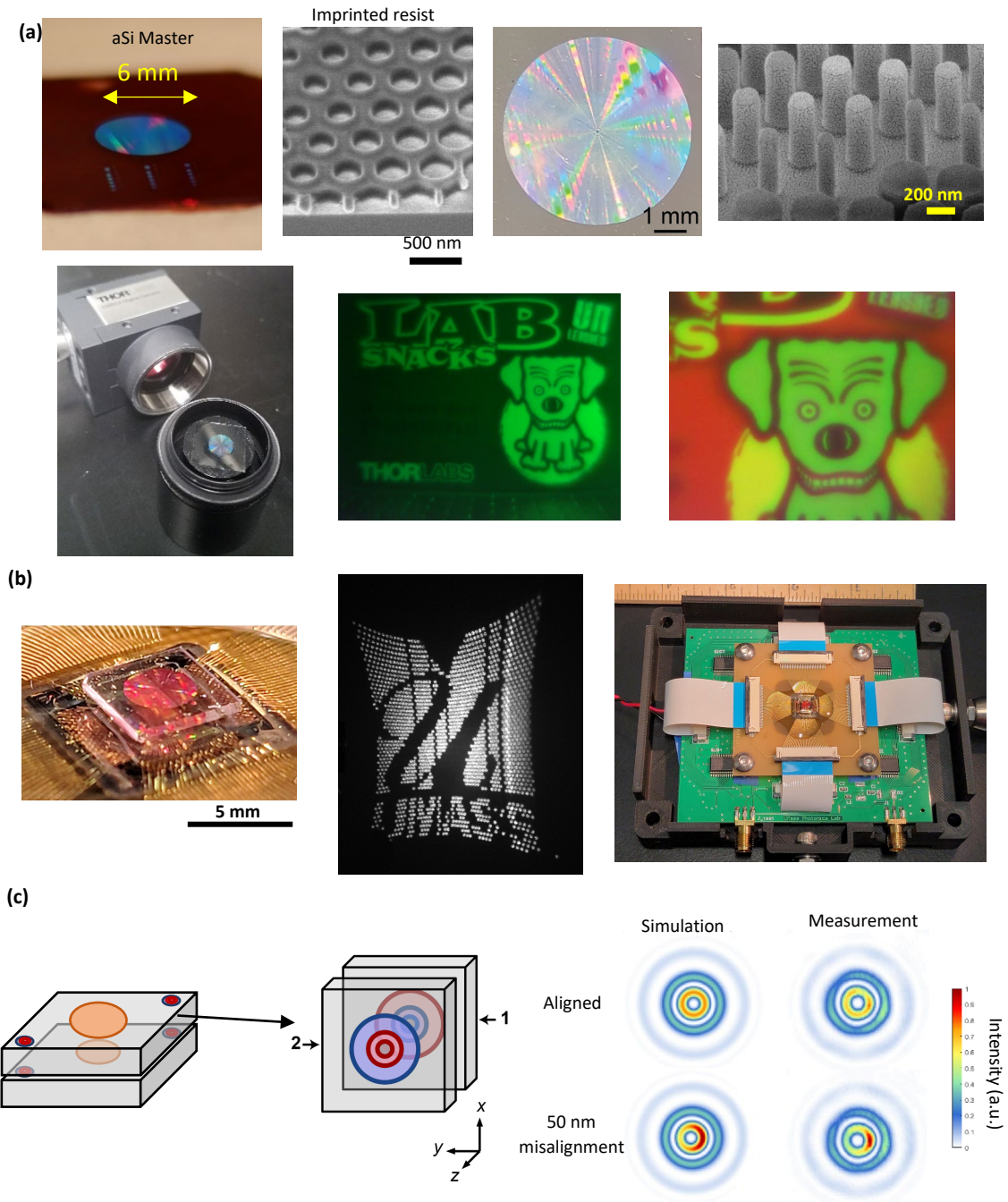


Figure 1. (a) 6-mm-diameter visible metalens fabricated using nanoimprint lithography. Single color and visible photos taken with the metalens. (b) Miniature, fully-integrated, laser beam scanner enabled by a metalens. (c) Highly accurate 3D alignment of two samples using metalens-based alignment marks.

References:

[1] Arbabi, A., Faraon, A. Advances in optical metalenses. *Nat. Photon.* 17, 16–25 (2023).