



- 1 *Precise mirror arrays in silicon.*
- 2 *RIE transferred lens array in glass.*
- 3 *Detail of high fill factor lens array mastered by lithography, reflow and RIE.*

COMBINATION OF LITHOGRAPHY, DRY ETCHING AND REPLICATION

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Proportional reactive ion etching (RIE) transfer of reflow photoresist structures is a well established microlens fabrication technology.

Interesting additional features can be generated by a suitable combination of this technology with polymer replication.

Concave microlenses in SiO₂ and Si

Reflow photoresist structures are typically convex, but the surface can be inverted introducing an additional polymer replication step. Accordingly, the inverted lenses can be transferred to the subjacent silicon or glass substrate. One example is the generation of precise concave mirror arrays in silicon.

Aspherical lens profiles

The surface of photoresist reflow lenses is typically spherical. A desired aspherical (elliptical, parabolic) profile can be achieved

using a suitable RIE transfer process. The generated structures can serve as master in a subsequent replication process.

Lens arrays with 100% fill factor

Typically, the fill factor of standard photoresist reflow lens arrays is reduced by the packing density of circular lens apertures and by the resolution of photolithography. Because of its isotropic etching behavior a subsequent RIE step can influence the fill factor.

This enables i.e. the generation of hexagonally packed lenslets with 100% fill factor which can again serve as a replication master structure.