Large Area Fabrication of Microlens by Residue-Free nanoimprint with thermal reflow processThermal Reflow Following Residue-Free Nanoimprint with V-Shaped Molds

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Generally, fabrication of microlens arrays have been regarded as expensive and complicated process. Here, we propose a facile method to form a microlens array with controlled lens curvature, by combining residue-free nanoimprint lithography (NIL) with V-shaped molds and the successive thermal reflow procedure of the printed polymeric structures. Nanoimprint lithography are a well-known method to construct micro- and nanostructures with low cost in high resolution. The V-shaped molds used in this studyenables the bottom substrate to be exposed without residual-layers after NIL process when the initial thickness is controlled. Then, we use thermal reflow to realize hemi-cylindrical curved lenses by applying heat. By the residue-free process, we can enlarge the temperature and duration ranges because the polymers are pinned on the exposed substrate, which is strong enough to fix the boundary not to dewet or be flattened in the temperature range of reflow process due to its high heat resistance. Furthermore, we demonstrate to modulate the curvature of lenses by controlling initial polymer thickness coated on a substrate.