Accounting for PDMS shrinkage when replicating structures

Polydimethylsiloxane (PDMS) is a widely used material for fabrication of microfluidic devices and for replication of micro- and nanotextured surfaces. Shrinkage of PDMS in the fabrication process can lead to leaking devices and poor alignment of layers. However, corrections to the mold master are seldom applied to counteract the shrinkage of PDMS. Also, to perform metrological measurements using replica techniques one has to take the shrinkage into account. Thus we report a study of the shrinkage of PDMS with several different mixing ratios and curing temperatures. The shrinkage factor, with its associated uncertainty, for PDMS in the range 40 to 120 °C is provided. By applying this correction factor, it is possible to replicate structures with a standard uncertainty of less than 0.2% in lateral dimensions using typical curing temperatures and PDMS mixing ratios in the range 1:6 to 1:20 (agent:base).

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