Releasing Polydimethylsiloxane (PDMS) Replica Parts from Micromolds

Jian Shao, Eric Miller
Washington Technology Center
Seattle, WA

Polydimethylsiloxane (PDMS) is the most popular silicon elastomer for fabrication of microdevices because it is durable, optically transparent, microelectronics compatible, and inexpensive. Thus, PDMS has variety of applications and can usually be replica-molded for low-cost mass production. However, releasing PDMS replica parts from SU-8 or metallic micromolds often proves to be challenging. A thin residual layer is formed on top of the micromolds after casting, even when a flat glass is compressed on top of the cast. In some case, this thin layer must be cleared in order to separate PDMS replica parts and/or transfer the pattern. We present a new approach to completely remove the thin residual layer by dry etching using reactive ion etching (RIE). Plasma parameters such as pressure, power, and the ratio of the mixed etchant gases are optimized to achieve the fastest etching rate through experiments. Meanwhile, different etchant gases, SF_6/He or CF_4/O_2, have been used to etch the PDMS residue layer and the results have been analyzed and proved that CF_4/O_2 has a faster etching rate and better sidewall protection.