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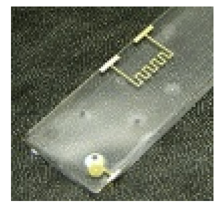
Polymer MEMS & Polymer Microfluidics

More than a decade ago, Manz and Harrison published their seminal paper on microfluidic devices etched into planar glass and silicon substrates. Research into these devices has since exploded and has moved from academic to the corporate laboratory.



Since the publication by Manz and coworkers, there have been many new and exciting applications of this powerful technology touching on many fields including medicine (e.g. biological fluid analysis), the environment (e.g. air or water analysis), defence (e.g. biowarfare detection), and proteomics (e.g. DNA or protein detection and analysis). As this technology becomes more widespread, there is pressure to make the devices less costly. One method to reduce the cost is to manufacture MEMS and microfluidic devices from polymers.

Polymers provide many benefits to MEMS and microfluidics. There are vast arrays of polymers that can be used to fabricate a variety of devices. The characteristics of polymers range from optically transparent to opaque, numerous colours, heat resistant, and chemically resistant. From a microfluidic point of view, there are polymers such as polycarbonate, PMMA (acrylic), or cyclic olefin (co) polymers that can be easily moulded that retain the optical transparency of glass. Additionally, polymers can be metallized with a variety of metals (e.g. gold, chrome, platinum, titanium, aluminum, etc). Polymers can also be used to form hybrid devices with other substrates such as glass or silicon.

One year ago, Micralyne embarked on an aggressive program to develop the necessary processes required for polymer MEMS and polymer microfluidics devices. This involves development of moulds necessary for replication of polymer devices with micron-sized features, replication methods necessary to reliably reproduce small features, metallization strategies, and polymer bonding strategies. Micralyne, using its current expertise in glass and silicon processing, can produce high quality moulds consisting of micron-sized features (1 micron to 100’s of microns deep or wide). Replication, depending on the device requirements, can be through injection moulding or hot embossing. Micralyne will also metallize polymeric devices with its strong thin film capabilities. Polymeric devices are well suited for price-sensitive products and for medium to high volume production. Micralyne is now ready to offer these services to clients interested in developing polymer MEMS and polymer microfluidic products.

The expectation is that simple devices currently produced in traditional substrates such as glass or silicon will see a 10-fold reduction in cost when produced using polymers at higher volumes. As the replication process ensures that there is a high fidelity between parts, polymeric devices provide an economical method to produce product at volume. As there is an array of polymers with different characteristics from which to choose, a suitable polymer is likely to be found for a wide variety of applications.

- Steve Jakeway, R&D Project Manager, Micralyne Inc. -

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