Microfluidic channel depth determination with Tywman-Green interferometer

Abstract

A microfluidic channel is fabricated on a silica wafer using reactive ion etching (RIE). The depth of the microfluidic channel has been measured using a surface profilometer and a Twyman-Green interferometer (TGI) setup. The TGI setup which mainly consists of a 660-nm wavelength He-Ne laser source, glass cube beam splitter and two prisms produced interference fringes based on the optical path difference between two interfering beams when the microfluidic channel is inserted into one of the beams. The TGI setup that was developed has shown high repeatability when measuring microfluidic channel depth and also eliminates back injection into the laser source and alignment criticality. The TGI setup applied a single photodiode to detect the shifting of the bright and dark fringe produced from the interference of the TGI. The depth of microfluidic channel obtained from the TGI is 1.79 ± 0.31 μm using fringe shifting and intensity measurements, while according to the surface profilometer the depth of microfluidic channel obtained is 1.67 ± 0.07 μm. The resolution of the TGI is 0.25 μm and can still go well below that depending on the wavelength of the laser source. This research describes the capability of the TGI to perform depth measurements on a microfluidic channel of a silica substrate which can also be improvised for other microscale devices and applications.