IN-SITU MICROMECHANICAL TESTING OF SU-8 POLYMER AT HIGH STRAIN RATES USING INDENTATION AND MICROPILLAR COMPRESSION

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SU-8 is a negative photoresist widely used for fabrication of microelectromechanical systems (MEMS), sensors, actuators, moulds and micro-fluidic devices [1]. For efficiently designing 3D microstructures out of SU-8, it is important to characterize its mechanical properties. Previous micromechanical studies on SU-8 have mainly focused on quasi-static strain rate testing [2,3]. Its mechanical properties at high strain rates is still unknown. This poster will present high strain rate test results on SU-8 using both micropillar compression and nanoindentation. Arrays of ~ 50µm diameter SU-8 pillars were fabricated by UV-lithography on a silicon substrate. This enabled performing large number of microcompression tests to generate statistics. The testing strain rate was varied between 10^{-2} to 10^{2} s^{-1}. In addition, nanoindentation tests were performed using a Berkovich tip over the same strain rate range. This allowed a direct one-to-one comparison of uniaxial compression and nanoindentation test results at micrometer length scales over the tested strain rate range. Further, the viscoelastic parameters for deformation were determined by performing relaxation tests in both test types. The match between micropillar compression and nanoindentation results will be discussed in detail. The reliable extraction of viscoelastic parameters from pyramidal indentation at high strain rates will be described. It is hoped that this study will provide the basis for more regular viscoelastic testing of polymers over a large strain rate range, particularly using nanoindentation.

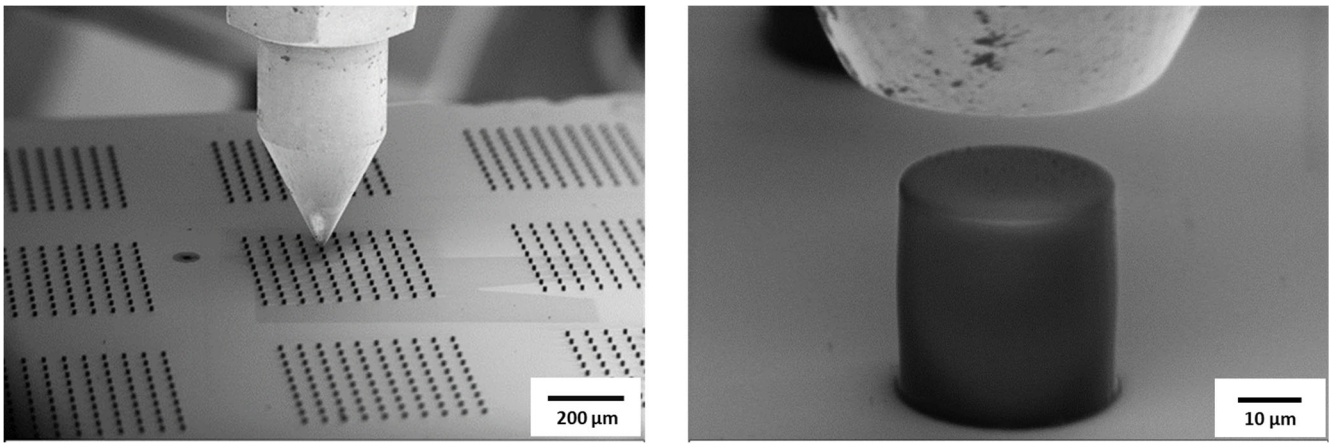

Figure 1.Microcompression of SU-8 pillar arrays fabricated by UV-lithography

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