Burst pressure of phaseguide structures of different heights in all-polymer microfluidic channels

We present an experimental investigation of the burst/overflow pressure of water and a representative surfactant-containing buffer in microfluidic channels with phaseguide structures oriented at an angle of 90° to the channel length as a function of their height. The all-polymer chips were fabricated by injection moulding and sealed by ultrasonic welding. Channels with a height of 200 μm and widths of 1 mm or 3 mm were investigated for five values of between 8 μm and 82 μm. Phaseguide structures without branches and with branches at angles = 45°, 60° and 75° were studied. All phaseguide structures were found able to pin both liquids and the burst pressure was found to increase approximately linearly with the height of the phaseguide from about 100–350 Pa for water and from about 25–200 Pa for the buffer. The burst pressure was found not to depend on the channel width and it was only weakly influenced by the presence of a branch on the phaseguide. For phaseguides with a branch, the liquid was always found to burst at the branch location. The measured burst pressures were compared to those estimated using a simple theory. The knowledge obtained in this study enables simple tuning of liquid spreading and overflow in microfluidic channels by use of phaseguide structures with different heights and it also provides a set of systematic experimental data to be compared with simulations/theory.

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