Electronic Supplementary Material (ESI) for Lab on a Chip.

Electronic Supplementary Information

A simple and low-cost chip bonding solution for high pressure, high temperature and biological applications

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1) Surface and optical characterization

The surface properties of the adhesive were further characterized by optical profilometry with the use of a Veeco WYKO NT1100 profilometer. As shown in Fig. S1a, a homogeneous roughness is present, below the micrometer range. More specifically, the Ra was estimated to be 131.9 ± 3.4 nm (Rq = 167.7 ± 5.0 nm).

Although perfectly transparent through bright field microscopy, the optical properties of the tape were also studied to determine the feasibility of accurate fluorescence imaging through the material. Fig. 1S shows the absorbance of the material (obtained with a Cary Series UV-Vis-NIR spectrophotometer, Agilent Technologies) for a large range of wavelengths from 200 to 800 µm. Fig. S1,b shows that the loss of light is negligible for all the visible spectrum and should therefore lead to no residual auto-fluorescence.

Finally, the wettability of the material was assessed with the contact angle of the water/air interface of droplets of 1 µL deposited on the surface of the tape: 101.9±1.1 degrees.

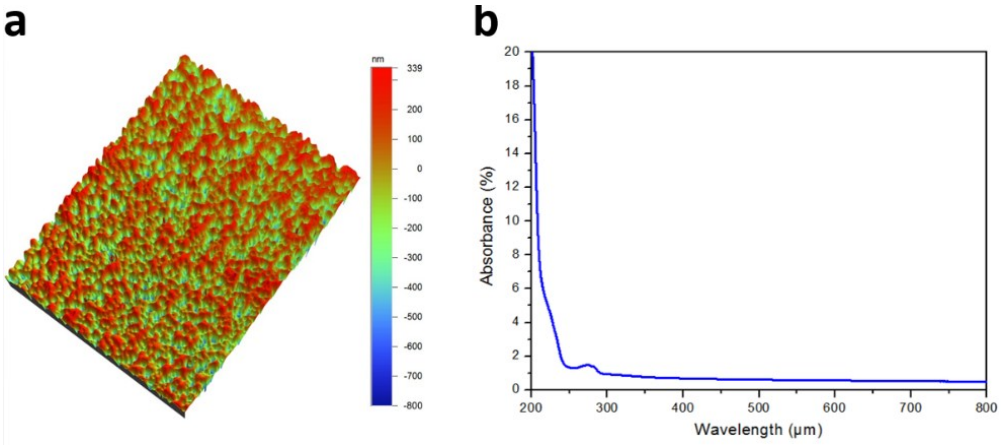

Fig. S1. (a) Optical profilometry image of the inner surface of the adhesive tape, showing a homogeneous and submicrometric rugosity. (b) Absorbance spectrum of the adhesive in the optical range reflecting the absence of significant absorption.

2) Response of the adhesive to cycling pressures

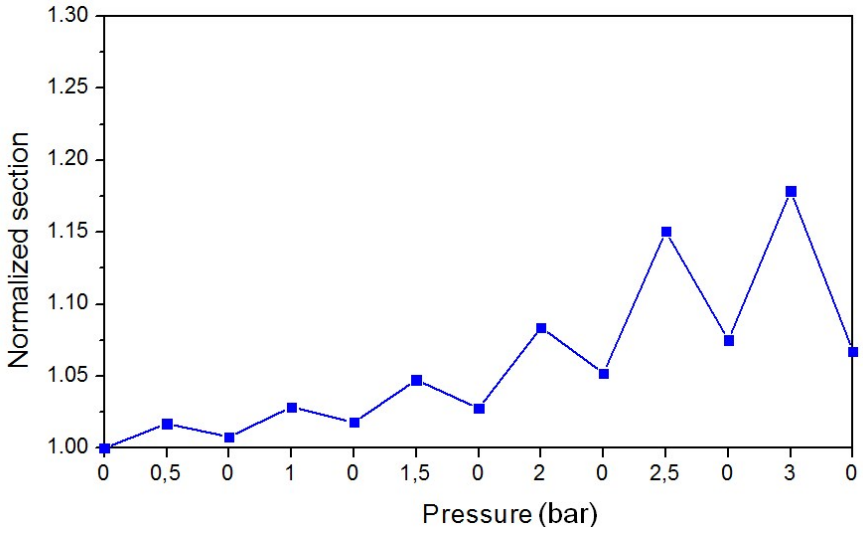

Fig. S2. Normalized section of a 200 µm channel sealed with the adhesive for a series of increasing pressures with alternate zero pressure conditions. The geometrical variations after each pressure cycle indicate a structural deformation that is both partially elastic and plastic. However, up to 2 bars the permanent section increase after pressure removal is below 5%.

3) Droplet monodispersity for long experimental times

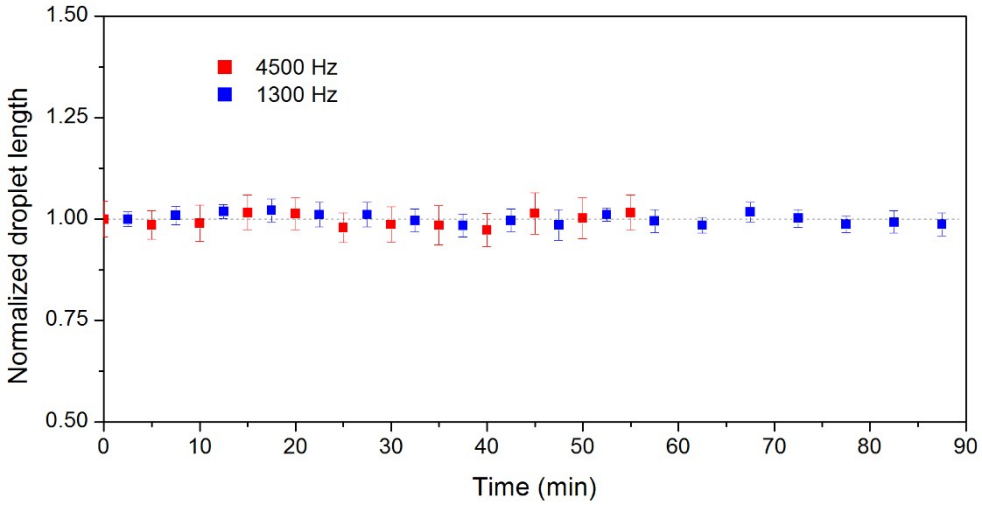

Fig. S3. The same experimental conditions of Fig. 3a were used to evaluate the stability of droplet formation (and hence adhesive integrity) by flow-focusing for long experimental times (1 h at 4500 Hz and 1.5 h at 1300 Hz). No significant deviations in droplet size were observed.

4) Chemical resistance to solvents

Solvent	Resistance
Ethanol (>99.8%)	+
Dimethyl sulfoxide (>99.9%)	+
Acetonitrile (>99.9%)	+
Cyclohexane (>99%)	-
Toluene (>99.5%)	-

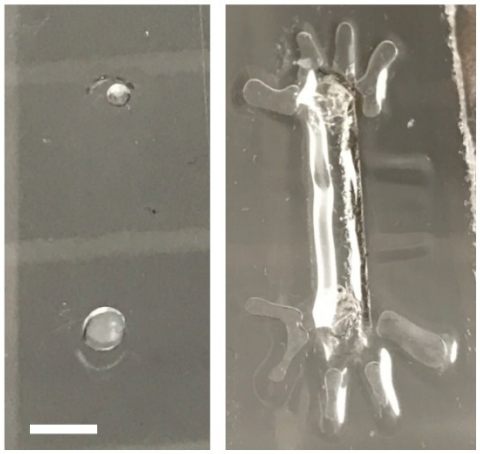

Fig. S4. The integrity of adhesive and sealing after exposure to organic solvents was evaluated by sealing a straight laser ablated glass channel (width: 3 mm, thickness: 0.5 mm and length: 25 mm). The channel contained one of the solvents indicated in the table and was let in contact for 24 hours. The resistance was evaluated by visual inspection (right images) and leakage after water insertion. The adhesive showed good resistance to polar solvents (dimethyl sulfoxide in the image on the left), and compromised integrity with non-polar solvents (cyclohexane in the image on the right).

5) Description of the PDMS cell culture chip

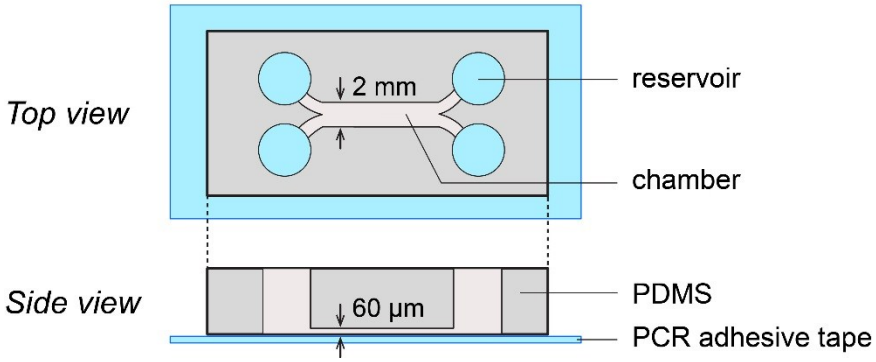

Fig. S5. Scheme of the PDMS chip used for cell culture. The chip has been realized by conventional replica molding technique starting from a SU-8 master and sealed by the PCR adhesive tape, where the cells are placed and grown. The chip presents four inlets (3 mm diameter) for cell seeding and culture medium supply, and a main chamber for cell proliferation.