Supporting Information

Monodisperse Polystyrene Foams via Polymerization of Foamed Emulsions: Structure and Mechanical Properties

Jonas Elsing, Tatiana Stefanov, Michael D. Gilchrist, Cosima Stubenrauch*

S1. Foaming Maps

The variation of pressure allows the control of the bubble size. As one increases the pressure of the dispersed phase the bubble size increases. When the pressure of the continuous phase is increased, the bubble size decreases. The variation of pressures also leads to a change of the pressure ratio between dispersed and continuous phase, i.e. the pressure ratio cannot be changed independently from the bubble size. To easily set parameters like the bubble size one has to measure a phase diagram or a calibration curve for each microfluidic chip. First of all, the limits for stable foaming have to be found. Within these limits the pressures of the continuous and of the dispersed phase can be varied systematically and the resulting bubble size for each pressure pair is determined. Plotting the pressure of the dispersed phase p_{Gas} versus the pressure of the continuous phase $p_{Emulsion}$ leads to phase diagrams for both, the chip with the 100 µm junction (left in **Figure S1**) and the chip with the 190 µm junction (right in **Figure S1**).

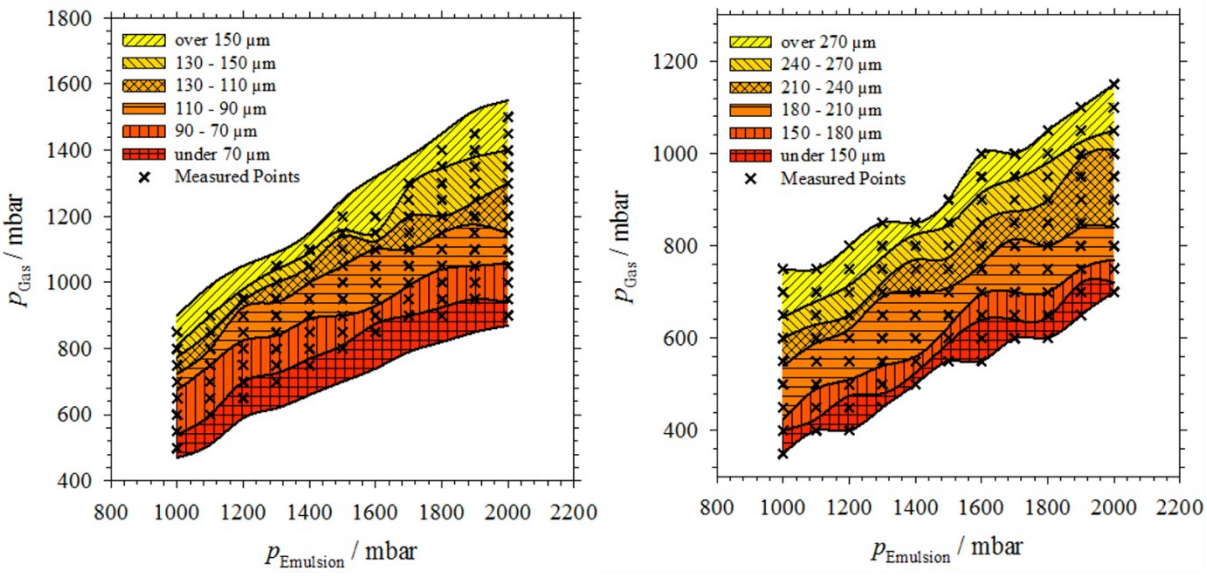

Figure S1: (Left) Foaming map for the Dolomite chip with the 100 µm junction and (right) foaming map for the Dolomite chip with the 190 µm junction.

S2. Measured Samples

The pore size, density, Young's modulus and shear modulus of the synthesized samples are summarized in **Table S1**. For samples measured with the NETZSCH DMA 242E (not marked specifically), the Young's modulus was determined at a temperature of 20 °C from the storage modulus *E'* taking into account that the loss modulus *E''* was ~ 0 Pa.

Table S2: List of measured samples (see Fig. 6)

sample	pore size d_{pore} / µm	density ρ_{foam} / g cm^{-3}	Young's modulus E_{foam} / MPa	shear modulus G_{foam} / MPa
100µm1000	139	0.299	54.80	19.7
100µm1050	154	0.152	30.20	23.4
190µm800	225	0.2912	60.94	34.9
190µm900	245	0.159	31.74	N/A
190µm950	255	0.171	32.60	13.4
190µm1000	285	0.118	8.50	7.67
300µm60	365	0.250	63.32	17.65
300µm80	588	0.059	0.77	N/A