Supplemental material

1. Normalization approach

The parameters with superscripts are the normalized input values

$$We_g' = (\ln We_g + 18)/18$$
$$We_l' = (\ln We_l + 8)/10$$
$$Ca' = (\ln Ca + 8)/8$$
$$(Q_g/Q_l)' = (Q_g/Q_l)/4$$
$$d_g' = d_g(\mu m)/1000$$
$$d_l' = d_l(\mu m)/1000$$
$$d_m' = d_m(\mu m)/1000$$
$$\alpha_{gm}' = \cos\alpha_{gm}$$
$$\alpha_{lm}' = \cos\alpha_{lm}$$

2. Trained neural networks

The file with the name “square.pkl” is a neural network reflecting the bubble generation in the square gas inlet for T-junction microdevices while the file with the name “circle.pkl” reflecting the circle gas inlet.