Nebulisation on a disposable array structured with phononic lattices

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Supplementary information

Supplementary Figure S1



Supplementary Figure S2



Figure S2: Comparison of the time taken to nebulise drops of water on the phononic superstrate and the plain superstrate.

Supplementary Figure S3



Figure S3: Nebulisation off the LiNbO₃ substrate. The substrate was patterned with an hydrophilic spot of 2mm in diameter using the same process as for the superstrates. Measurements for powers above 2W were not possible as the drop could not be help within the spot. Results show that the time to nebulise a 2 μ l drop on the substrate using 1.6 W is 5 times shorter than when using a plain superstrate. However, as the nebulisation phenomenon is strongly dependant on the droplet shape,^{1,2} any interpretation in terms of transmitted power may need to consider the change in surface energy.

Supplementary Figure S4



Figure S4: Droplet size number distribution. The number distribution changes the visualisation by favoring small droplets when compared to the volume representation. Here the arithmetic means are 0.35 μ m +/- 0.16 for the plain superstrate and 0.43 μ m +/- 0.19 for the phononic superstrate. For drug delivery applications and proteomics, the efficiency of a nebulisation system is linked to the amount of compounds transferred (i.e. the volume for a fixed concentration) for a certain size. For example in drug delivery applications, droplets above a certain size will not reach deep enough within the body⁴.

Movie Legends:

Movie M1: Nebulisation on the phononic structure at 12.6 MHz. A 1 μ l droplet of DI water was placed on each of the 3 spot locations on the cone phononic superstrate and nebulised using SAW excited with a frequency of 12.6 MHz and a power of 3 W. Only the droplet in position 3 nebulises.

Movie M2: Nebulisation on the phononic structure at 9.4 MHz. Conditions identical to Movie M1 were used, with the exception of the excitation frequency of 9.4 MHz. Only the drop placed in position 1 nebulises.

Movie M3. Nebulisation on the phononic structure. The nebulisation of a DI water droplet (1 μ I) was performed on the cone phononic superstrate using an excitation frequency of 12.76 MHz and an applied power of 1.25 W (-5 dBm). The movie was captured at a frame rate of 200 fps, and is playing at 30fps, making 6 times slower than the actual experiment.

References:

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