MONASH University

MONASH INNOVATION

TUNEABLE NEBULISER FOR SMALL PARTICLES

A novel method of tuning a handheld nebuliser involving sending an acoustic frequency over a substrate and a high aspect ratio channel such that a consistent particle size in the range of 3-5µm diameter can be achieved.

- **Tunable particle size of 3-5 µm**
- **Efficient atomisation of fluid**
- **Low heat and disposable**
- **Unpumped flow of .12ml/min**

THE CHALLENGE

Traditional atomisers are limited in their ability to produce fluid particles with a diameter of less than 5µm. Having a fine particle size can assist in the delivery of drugs contained in the particle fluid to areas of the lungs which would normally not be reachable by larger particles. Consistent, fine particle size can also be advantageous in areas such as mass spectroscopy and aromatics.

Surface acoustic wave nebulisers also suffer the drawback of not having a sufficiently high volume throughput and in generating a significant amount of heat. The current technology addresses these issues and is also of a type of design which is low cost and suitable as a disposable device.

THE TECHNOLOGY

The apparatus developed uses a piezoelectric exciter attached to a substrate. The lightweight combination of the two allows frequencies of 1-5MHz to be applied to the substrate.

The acoustic vibration draws the fluid from a reservoir into a high aspect ratio channel. The channel can have a width of 3-20µm with a depth 7-15 times the width.

A distinguishing feature of this design compared to other surface wave nebulisers is that the exciter does not directly contact the fluid to be atomised. Capillary action draws the fluid into the channel and the piezoelectric exciter does not contact the fluid medium; atomisation occurs when the vibration is turned on. The micro particles are produced from the channel at a contact angle with the fluid.

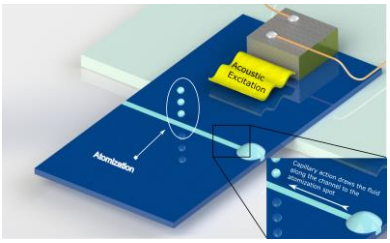

Figure 1. Capillary action draws fluid into the channel.

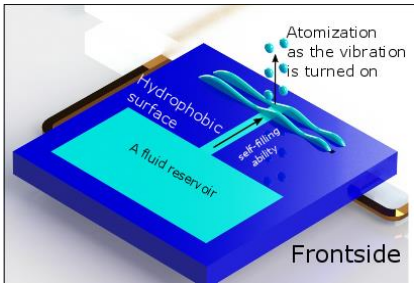

Figure 2 Atomisation occurs as the vibration is turned on.

Multiple channels can be included to improve throughput. These additional channels can be in parallel, of different widths or whatever design is deemed most optimal.

The result of having micro channels on the substrate is that the apparatus can be tuned to consistently produce particle sizes of between 3-5µm. The test results in Figure 3 show particle size in the range of 3-5 µm which is not significantly impacted by channel width.

We have also tested for peak flowrate from our prototype testing. We have demonstrated a flow rate of 0.12ml/min for unpumped capillary action and 0.27ml/min for a syringe pump.

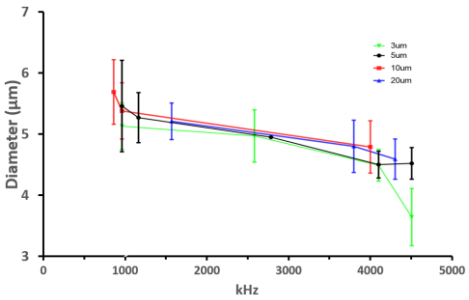

Figure 3. Test results showing particle size in the range of 305MHz, which is not significantly impacted by channel width.

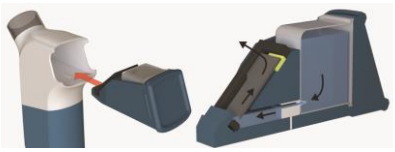

Figure 4. Proposed product design for a handheld device.

THE OPPORTUNITY

Monash seeks a partner to optimise and adapt the system for application.

We propose a product design, as shown in Figure 4. This design is for use in handheld drug delivery devices, but the potential uses are much broader. We are currently working on delivering particles for mass spectroscopy. The technology may also have an application in the area of thin film deposition or for aroma generating devices.

The team consists of experienced microelectronic device engineers and medical consultants.

CONTACT US

Monash Innovation
T: +61 3 9905 9910
E: innovation@monash.edu
www.monash.edu/industry

GROUP OF EIGHT AUSTRALIA