MONASH University

Tuneable nebuliser for small particles

MEDTECH: Device – Drug Delivery

The Challenge	Traditional atomisers are limited in their ability to produce fluid particles with a diameter of less than 5µm. 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 Solution	Our solution is 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.
Key benefits	• Tuneable particle size of 3-5 µm • Efficient atomisation of fluid • Low heat and disposable • Handheld device - lightweight
Development Stage	Proof of Concept completed
Brief Description & Differentiation	The apparatus uses a piezoelectric exciter attached to a substrate. The lightweight combination 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. 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. 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 2 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 and have demonstrated 0.12ml/min for unpumped capillary action and 0.27ml/min for a syringe pump. We propose a product design as shown. 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.
Research Team	Led by Dr Tuncay Alan (Department of Mechanical and Aerospace Engineering).
Intellectual Property	PCT application filed (2019).

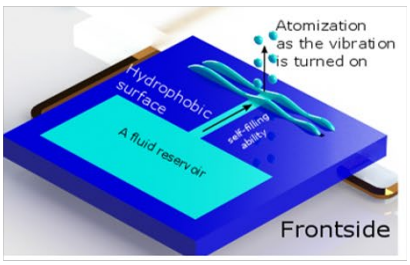

Figure 1. Schematic depicting device in operation

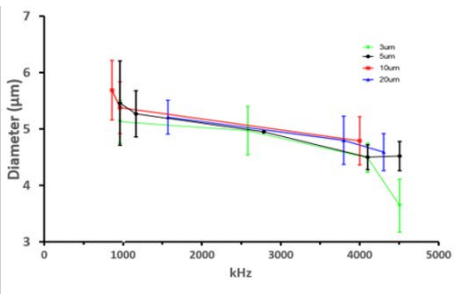

Figure 2. Particle size can be tuned between 3-5 µm