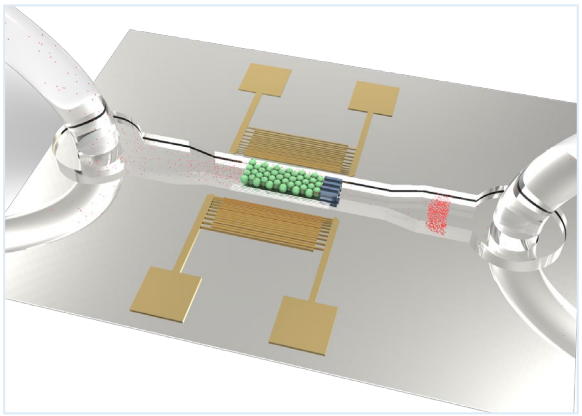
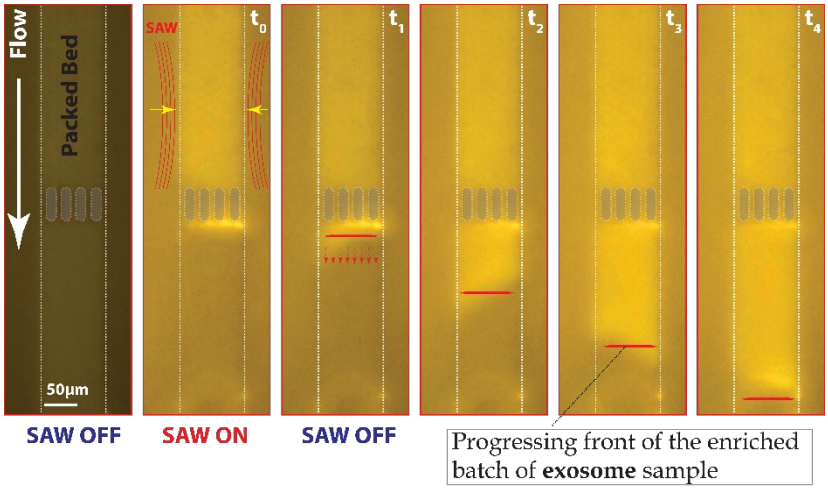
MONASH University

Efficient Exosome Purification

PHYSICAL SCIENCES / MEDTECH: Materials Processing

The Challenge	The therapeutic exosome market is currently primarily held back by the lack of an efficient proprietary exosome extraction and purification process technology that would enable manufacture of a proprietary exosome product at clinical and then pharmaceutical grade and scale.
The Solution	Monash has developed a novel filtration system based on ultrasound surface acoustic waves to trap nanoparticles, exosomes and liposomes in a continuous flow, without any prior functionalization or preparation. The method is contact-free and label-free. It has been tested on polymeric nanoparticles with sizes down to 100nm, with 97% capturing efficiency, as well as liposomes for membrane integrity studies and labelled exosomes. It is ideal for separation, filtration and/or enrichment processes.
Key benefits	• Label-Free method, e.g. no need for chemical functionalization of the bed • No blockage • Potential for upscaling • Fast • Great capturing efficiency • Membranes remain intact as determined by EM studies using liposomes
Development Stage	Laboratory Working Prototype
Brief Description & Differentiation	The technology is based on excitation of a packed-bed of microstructures, by applying ultrasound surface acoustic waves (SAW). Upon activation of the microstructures, the nanoparticles of specific size are trapped within the bed; the enriched batch of nanoparticles can then be released to an outlet by switching off the surface acoustic wave. As the trapping mechanism is based on the resonant mode of the microstructures, rather than the microfluidic channel size, there is excellent potential for upscaling.
Research Team	Prof Adrian Neild and Dr. Rui Habibi, Mechanical and Aerospace Engineering
Intellectual Property	PCT filed





Schematic of Microfluidic Device for Exosome Purification: A packed-bed of microstructures is embedded in a microfluidic channel and can be excited at microstructures' resonant frequency by SAW generated by the interdigital transducers.

Capture and subsequent release of exosomes: Time-lapsed experimental demonstration of capturing fluorescent-dyed exosomes and the propagation of the enriched batch into the upstream. The exosomes with mean size of 167 nm and labelled with ExoGlow protein EV labelling (EXOGP100A-1) flowed through a channel with packed-bed of microstructures. t_0 to t_4 shows the concentrated batch of exosome and its propagation after release by turning off the ultrasound.