

ASX Announcement ([ASX: AXE](#))

31 August 2020

## 3D printed biosensor device hardware

### Highlights

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- Archer is progressing its graphene-based biosensor technology prototype development using low-cost, rapid 2D and 3D printing.
  - 3D printers have been used to build proof-of-concept cartridge components for Archer's biosensor devices.
  - The Company's 100% owned international patent application has been published online by the World Intellectual Property Organisation ("WIPO").
  - Technology development is advancing, with a focus on linking the core biosensing elements and function to portable and robust device hardware.
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Archer Materials Limited ("Archer", the "Company", "[ASX: AXE](#)") is pleased to announce the Company has progressed its graphene-based biosensor technology ("biosensor device") development by successfully prototyping key device hardware using additive manufacturing ("3D printing").

The world-class infrastructure, facilities, R&D personnel, and best-in-class 3D and 2D printers are available to Archer through the Company's collaboration with the University of Adelaide, as a founding industry partner of the [ARC Research Hub](#) for Graphene Enabled Industry Transformation ("ARC Graphene Hub").

**Commenting on the Company's biosensor development, Archer CEO Dr Mohammad Choucair said:** "Additive manufacturing allows Archer to make prototypes of key biosensor elements in less than a few hours. By using 3D printing we are able to accelerate progress towards commercialising Archer's innovative graphene-based biosensor technology".

"When the Company undertook the recent Share Purchase Plan the main purpose of the fund raising was to allow the Company to accelerate the pace of development of our key projects and technologies. The 3D printing of biosensor components is consistent with that strategy."

### 3D printing assisted prototyping

A video of the biosensor device cartridge 3D printing can be found [here](#).

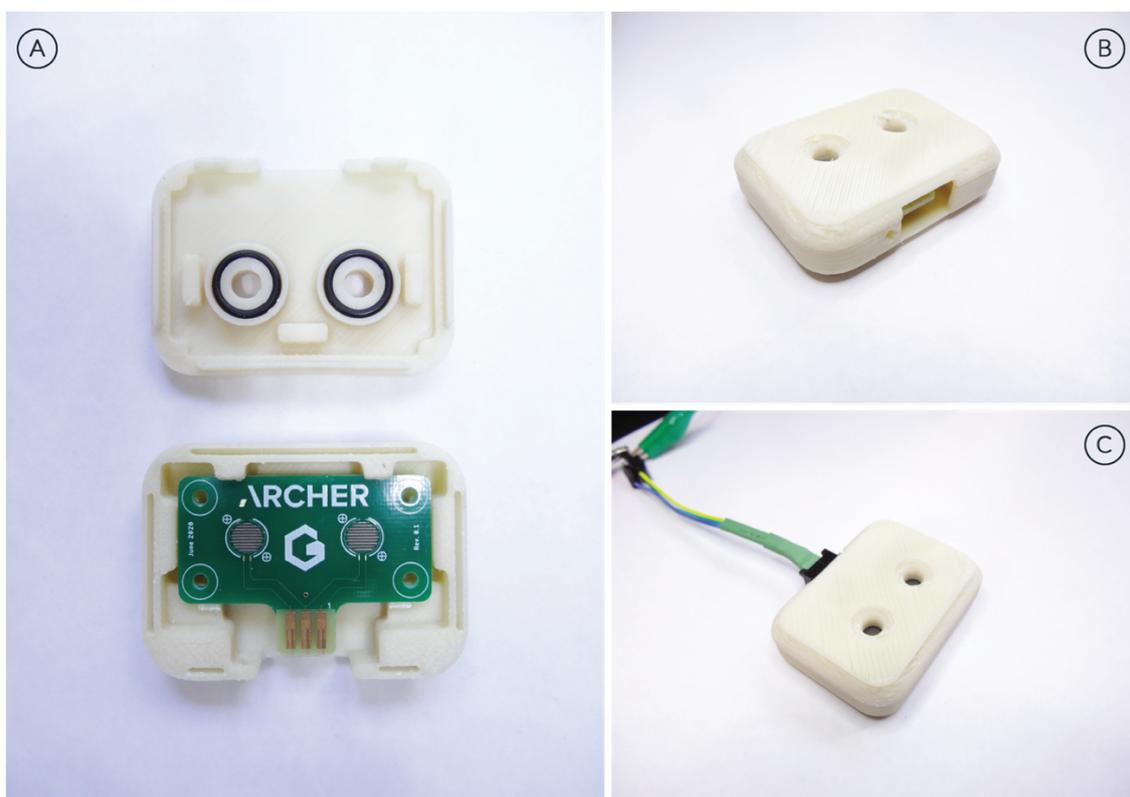
Proof-of-concept cartridges were 3D printed for Archer's graphene-based biosensor devices (Image 1). The cartridges are printed using [acrylonitrile butadiene styrene](#) ("ABS"), a robust engineering plastic (e.g. used in manufacturing Lego), in less than 2 hours using ABS costing \$0.50, with the cartridges weighing approx. 13 grams (similar to a 'AAA' battery) and measuring a few centimetres in size (palm size).

### 3D printing is not a substitute for high-volume manufacturing

3D printing is a viable means for Archer to rapidly produce biosensor device prototype components. The cartridge prototypes address challenges associated with portable biosensor device handling and biosensing processes, including physical damage and contamination.

For the detection of analytes in fluids, a key benefit of the cartridge design is the incorporation of *liquid wells* to prevent undesirable fluid flow (e.g. spillage) and to provide greater control over evaporation during analysis which could improve *accuracy* and *reproducibility* in device function, key requirements in an operational biosensor. The liquid wells can hold sample volumes of up to 20 microlitres. There are two wells in the current design because the device incorporates two biosensors, here one serving as a reference sensor.

The entire device has been developed end-to-end in-house, with cartridge prototyping ongoing and includes designs that may allow for reuse and biosensor multiplicity. The prototype device shown below is an early-stage graphene sensor (unoptimised with limited function) that can detect various ions and molecules in water for Archer's biosensor development purposes (i.e. the device will measure a response and output signal that can be detected and quantified).



**Image 1.** **A** Graphene-based biosensor devices 2D printed on a circuit board (shown as interdigitated electrodes on green circuit board with logos) that has been incorporated into the custom designed and 3D printed cartridge made from ABS. The cartridge is opened and the interior shown. **B** The 3D printed cartridge enclosure with two liquid wells present unambiguously at the top of the prototype to easily guide placement of fluids during testing (e.g. via pipetting) and a side port opening to allow for connection to the analysis interface as shown in **C**, providing a rapid 'plug and use' function without need to determine orientation or polarity of connections.

## International patent has now been published by WIPO

The Company maintains 100% ownership of a patent application filed under the Patent Cooperation Treaty (“PCT”) to protect and commercialise intellectual property (“IP”) associated to the graphene-based biosensor materials technology. This patent application has now been published by WIPO and full details are available for [viewing online](#).

Archer’s graphene-based biotechnology is at an early stage of commercialisation, and maintains a competitive advantage that involves a new class of graphene materials technology that would allow for selective hierarchical chemistry to the single molecule level with the potential to solve selectivity and detection challenges in biosensing. This type of knowledge is very difficult to acquire and is supported by outcomes of several years of R&D that ranks in the top percentiles of peer reviewed scientific published works globally<sup>†</sup>.

## Chemistry is key in Archer’s biosensor deep tech roadmap

There are very few materials in existence capable of performing biosensing rapidly and accurately for human health diagnostics. The Company’s technology development has an ongoing focus on exploiting the advanced chemistry of its new graphene materials to arrive at a minimal viable product capable of rapid multi-disease detection and portable device integration.

Further reading with more technical details on Archer’s [use of graphene for biosensing](#) and the Company’s [progress in biosensor technology development](#) is available online.

## About Archer

A materials technology company developing materials in quantum computing, biotechnology, and lithium-ion batteries, and exploring for minerals in Australia. The Company has strong intellectual property, broad-scope mineral tenements, world-class in-house expertise, a unique materials inventory, and access to over \$300 million of technology development infrastructure.

The Board of Archer authorised this announcement to be given to ASX.

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For more information about Archer’s activities, please visit our:

Website:

<https://archerx.com.au/>

Twitter:

<https://twitter.com/archerxau?lang=en>

YouTube:

<https://bit.ly/2UKBBmG>

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<sup>†</sup> <https://pubs.rsc.org/en/content/articlelanding/2014/cc/c4cc04521a#!divAbstract>  
<https://pubs.rsc.org/en/content/articlelanding/2016/CC/C5CC07611K#!divAbstract>