Archer Materials Limited (ACN: 123 993 233)
Lot Fourteen, Frome Road, Adelaide SA 5000

ASX Announcement (ASX: **AXE**) 13 January 2022

Graphene integrated with silicon electronics

Highlights

- Archer addresses a key nanotech challenge in its biochip development by successfully integrating single atom-thick graphene on a silicon wafer.
- Archer intends to use graphene as an ultrasensitive sensor for detecting and analysing diseases.
- The biochip has been developed in-house by Archer staff and Archer owns 100% of the biochip technology intellectual property.

Archer Materials Limited ("Archer", the "Company", "ASX: **AXE**") is pleased to provide shareholders with a technical progress update on Archer's 'lab-on-a-chip' technology ("biochip"). Archer owns 100% of the biochip technology intellectual property.

The Company is developing a biochip that would allow droplets of biological specimens to be analysed and processed using graphene-based sensors. The biochip requires graphene materials in electronic circuits (i.e. the micro- and nanofabrication of graphene-based transistors), that would form miniaturised devices that act as ultrasensitive sensors for detecting and analysing biochemical targets, for example, to identify viruses or bacteria.

Recently, the Company announced that it had successfully fabricated nanosized electronic components on silicon wafers, inside hair-thin microfluidic channels required for lab-on-a-chip functions of mixing and transportation of biological specimens (ASX ann. 4 Nov 2021). In parallel, the Company also developed chemical reaction pathways to potentially allow for future applications of Archer's biochip in the detection of various diseases (ASX ann. 1 Dec 2021).

The Company has now, with its in-house capability, successfully integrated a single-atom-thick sheet of graphene with silicon electronics (Image 1). Archer staff used a state-of-the-art electron beam lithography system to repeatably and reproducibly fabricate the graphene devices. The work represents a significant technical achievement as it required the precision engineering of atomically thin materials and devices that are fundamental to the scalability, biosensing functionality, and operation of the biochip.

Graphene is an advanced material with electronic properties on the nanoscale that make its use for biosensing highly advantageous. It has unparalleled properties like high electron mobility and chemical stability in biologically relevant liquids that allow it to be used as an electrical conduit for sensing the activity of biological molecules.

Archer's biochip design principles include the micro- and nano-fabrication of integrated sensing devices in regions of a chip that work alongside other fabricated functional regions *on the same chip* to process, detect and analyse biological specimens. Graphene, when integrated into a nanoelectronic device, would act as the sensing component of the biochip, to detect and process the biosensing signals. The work done by Archer in fabricating graphene devices is an important step in the potential future operation of Archer's biochip.

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Commenting on the biochip development progress, Archer CEO Dr Mohammad Choucair said: "Archer's use of advanced lithography systems to successfully integrate graphene with silicon electronics is a significant step in the Company's biochip development. This is the culmination of a lot of strategic planning and coordination involving talented people, world-class facilities, and technology to get to this point. It's exciting that Archer's ^{12}CQ quantum chip development could also benefit from this latest achievement."

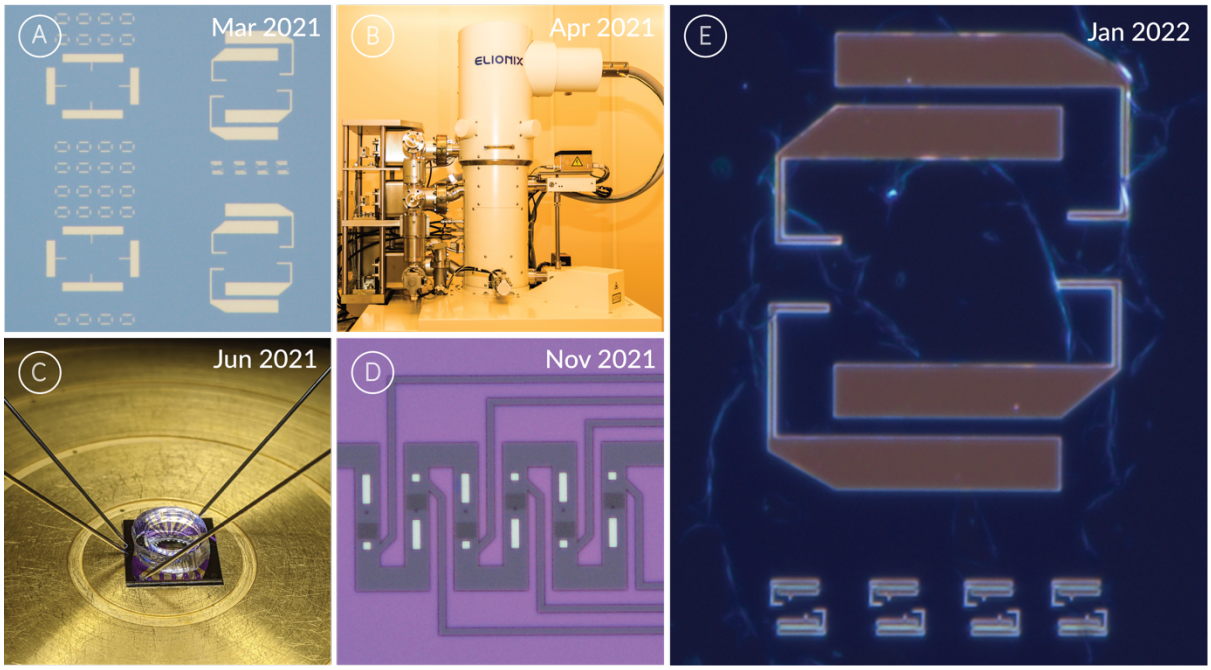

Image 1. Archer's progress in its biochip nanofabrication. A Miniaturisation of biosensing electrode components to 100-150 nanometre feature size on silicon wafers which would translate to approx. 1 million sensor components per cm^2. **B** Archer expands its access to state-of-the-art institutional deep tech infrastructure and facilities. The image shows an Elionix ELS-125 electron lithography system which was used to arrive at the outcome in this Announcement. **C** Archer establishes chip testing operations in a semiconductor fabrication environment for the testing of graphene devices and their operation. **D** Archer fabricates and integrates nanosized biochip electrodes similar to those in **A** in microfluidic channels on chip compatible substrates demonstrating increased compatibility with functions required for lab-on-a-chip biosensing. The microfluidic channels are about 3 times thinner than a human hair. **E** Optical microscope image looking directly down onto a silicon wafer containing graphene integrated with metallic electrodes similar to those in **A**. The graphene is barely visible in the device, as the material is only a single atom thick (less than a billionth of a metre), however some (blue) scratch-like lines appear due to crumpling in the graphene sheet.

About Archer's Biochip

Archer's biochip is lab-on-a-chip technology the Company is developing to enable the complex detection of some of the world's most deadly communicable diseases. The biochip development commenced in Nov 2020 (ASX ann. 5 Nov 2020). Archer is currently focused on micro- and nano-fabrication of the biochip device components and combining these components with biochemical reactions to detect diseases (ASX ann. 1 Dec 2021), which pose significant technological challenges to potentially commercialising lab-on-a-chip devices.

About Archer

Archer is a technology company that operates within the semiconductor industry. The Company is developing and commercialising advanced semiconductor devices, including chips relevant to quantum computing and medical diagnostics.

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

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