

# Nanocube Ink Nanomaterial

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Australian Advanced Materials

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30/01/2020.





# Australian Advanced Materials

## Team Behind The Technology

- AAM was established to develop and commercialise revolutionary materials technology being developed in Australia. 100% owned by Strategic Elements Ltd.
- AAM licenced the underlying Nanocube Ink technology from the University of New South Wales. Multiple application potential, however most development to date focused on memory/data storage aspects of the technology.
- UNSW is globally recognised as a leading research institution in Materials Science and Engineering. Dr Chu, co-inventor, is recognised for his contribution to oxide nanoelectronics, including RRAM and TFT.
- Research and development work has also been progressed with teams from VTT Finland and the CSIRO Australia. AAM is also a member of PrintoCent in Oulu, Finland.



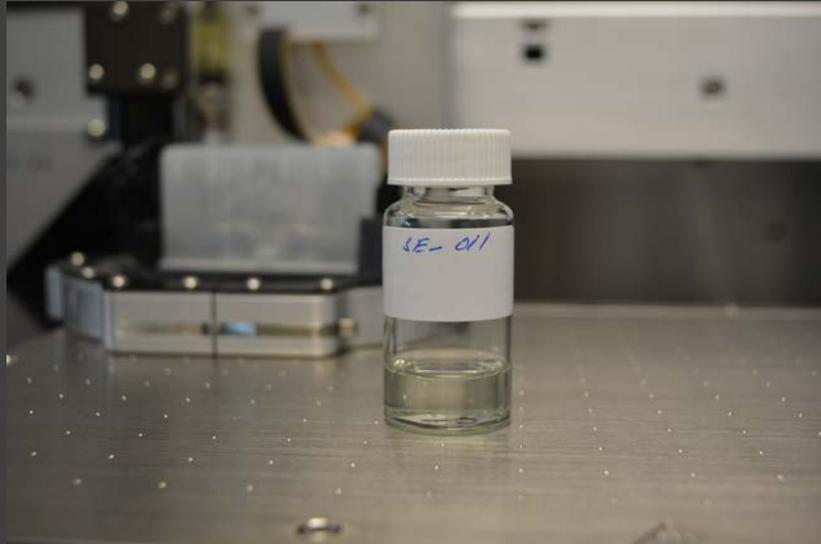
UNSW  
SYDNEY



PrintoCent

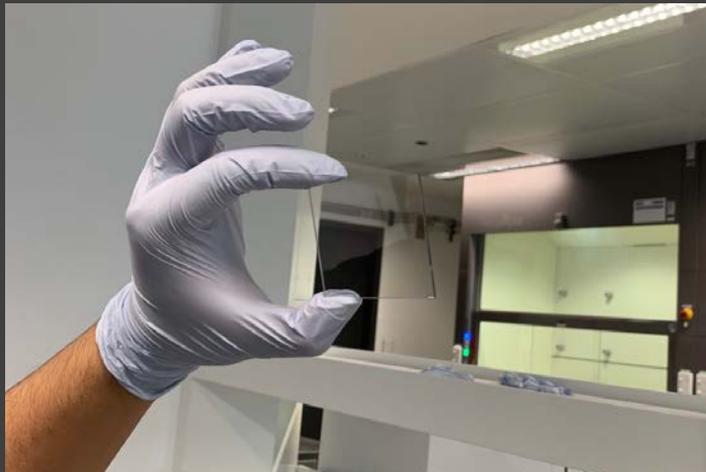
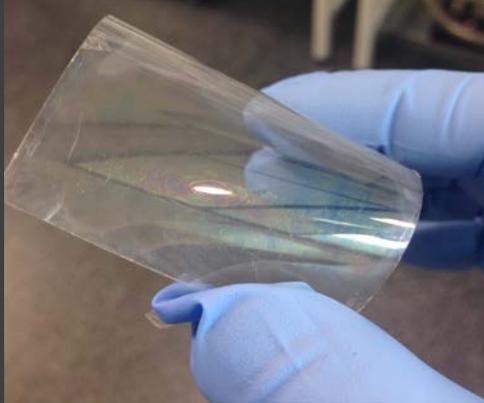
VTT

# Nanocube Memory Ink



- The Nanocube Ink technology has **multiple application potential**.
- The first application being developed is a RRAM technology for storage and memory, the **Nanocube Memory Ink**.
- The Nanocube Memory Ink is a transparent ink containing billions of nanometre scale particles. When printed onto a surface and assembled with electrodes they operate as computer memory.
- Current memory technology is restricted to RF sputtering onto more rigid silicon materials in semiconductor fabs. Whereas this technology is a fully printed, transparent memory technology fabricated at room temperature onto non-silicon materials.
- Favourable properties for Printed Electronics applications, particular those that benefit from locally stored data.
- US Patent granted in January 2020 related to RRAM memory and methods of manufacture. Pending patent applications related to further aspects of this technology.

# Nanocube Memory Ink



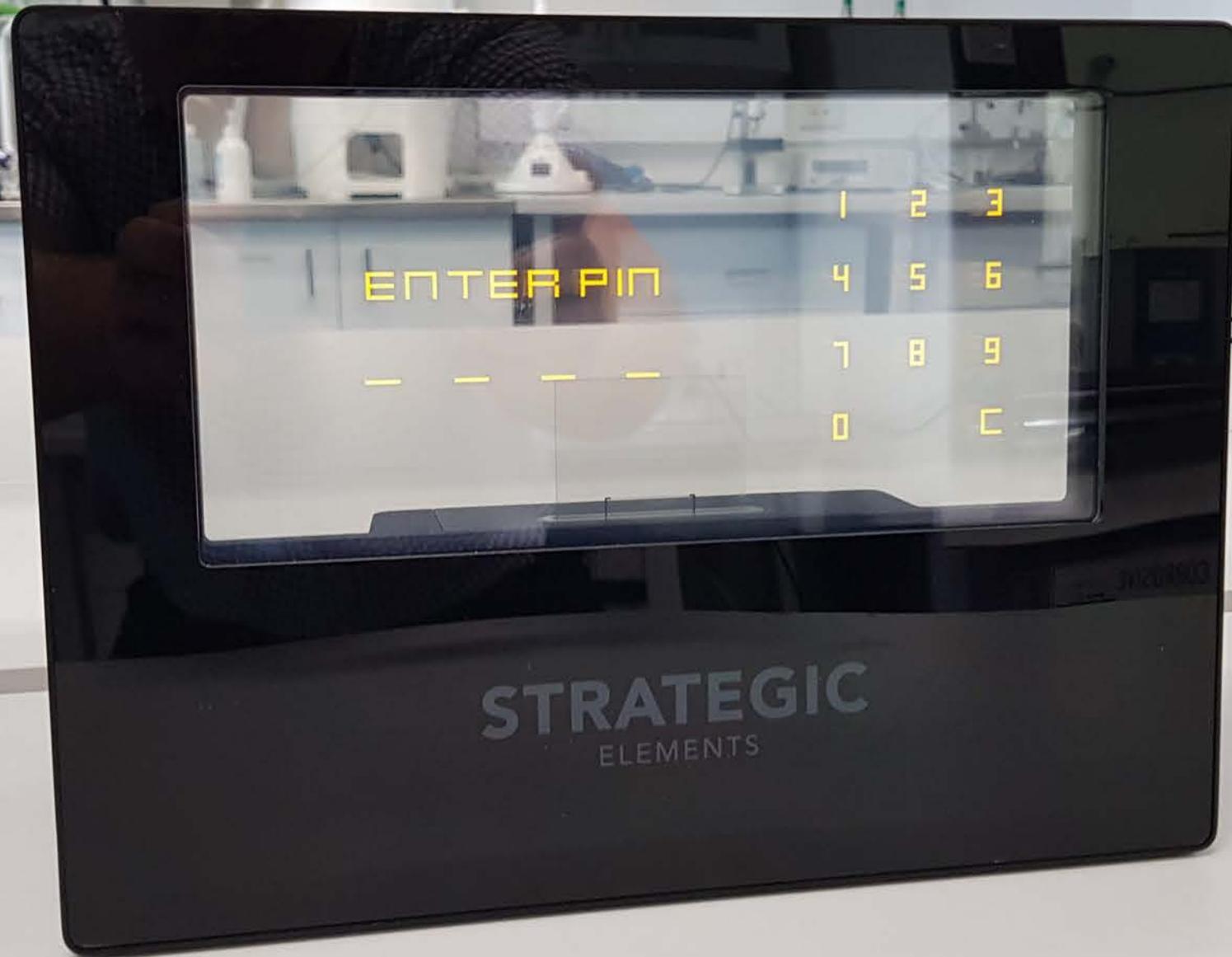
- Key milestones achieved to date across a range of prototypes include:
  - Successful scale up for synthesis process to produce large volumes of Nanocube Ink;
  - Stable yield of operating storage cells across printed devices;
  - Uniform electrical behaviour across devices;
  - 1000+ endurance cycle results;
  - Results on glass and plastic substrates
  - Slot-die / ink-jet printable;
  - > 80% optical transparency;
  - Promising early flexibility testing;
  - Ultra thin film;

# Transparent Glass Demonstrator



- Fabricated an access control system with UNSW and VTT Finland to highlight the **transparent, printable** characteristics of the Nanocube Memory Ink.
- The role of the Nanocube Memory is to store authentication data for use as part of a Transparent Security Access System.
- Third party transparent display and touch sensor component was integrated with the transparent Nanocube Memory Ink and custom application logic developed by the team.
- The initial version showcases the transparent nature of the Nanocube Memory and the ability to print functional memory onto glass. A writable device was demonstrated utilizing ITO. Further performance enhancements expected.
- Subsequent versions with different functions to security. Could store a range of information or images **directly** on a glass display or window. Could be combined with sensors and other computer vision technologies.

# Transparent Glass Demonstrator – Access Control System



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# The Opportunity

- Dramatic expansion in storage requirements.
- Expanding Printed Electronics applications.
- Enhanced Security.
- Edge applications requiring compute and data storage as a result of more processing at the edge.
- Delivering storage on glass and plastic for transparent, structural and/or flexible electronics (**freedom of design forces a re-think of new product applications and categories**).

*Memory is at the heart of transparent and flexible electronics and the development of a printed, transparent memory component could dramatically increase the ability for new applications to be developed globally.*



# Part of the Roadmap 2020

- Seeking research and development partners with advanced printing capabilities, suppliers of innovative glass, plastic substrates or materials for patterning of substrates.
- Deliver a prototype Nanocube **selector** technology with capacity to **dramatically increase printable memory storage density**.
- Expand development on plastic and deformable substrates.
- Fabricate a Nanocube Memory **demonstrator device with 2D storage array on a flexible material**.
- Showcase proof of concept for **alternative applications** of the Nanocube Nanomaterial.
- Seek potential **licensing** partner or **strategic funding** partner for the Nanocube Nanomaterial.
- Secure an additional funding grant from the Australian Government.

Thank you

