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Scientists break new ground in memory technology

Research team led by NUS scientists develop a novel organic thin film that outperforms existing flash memory devices

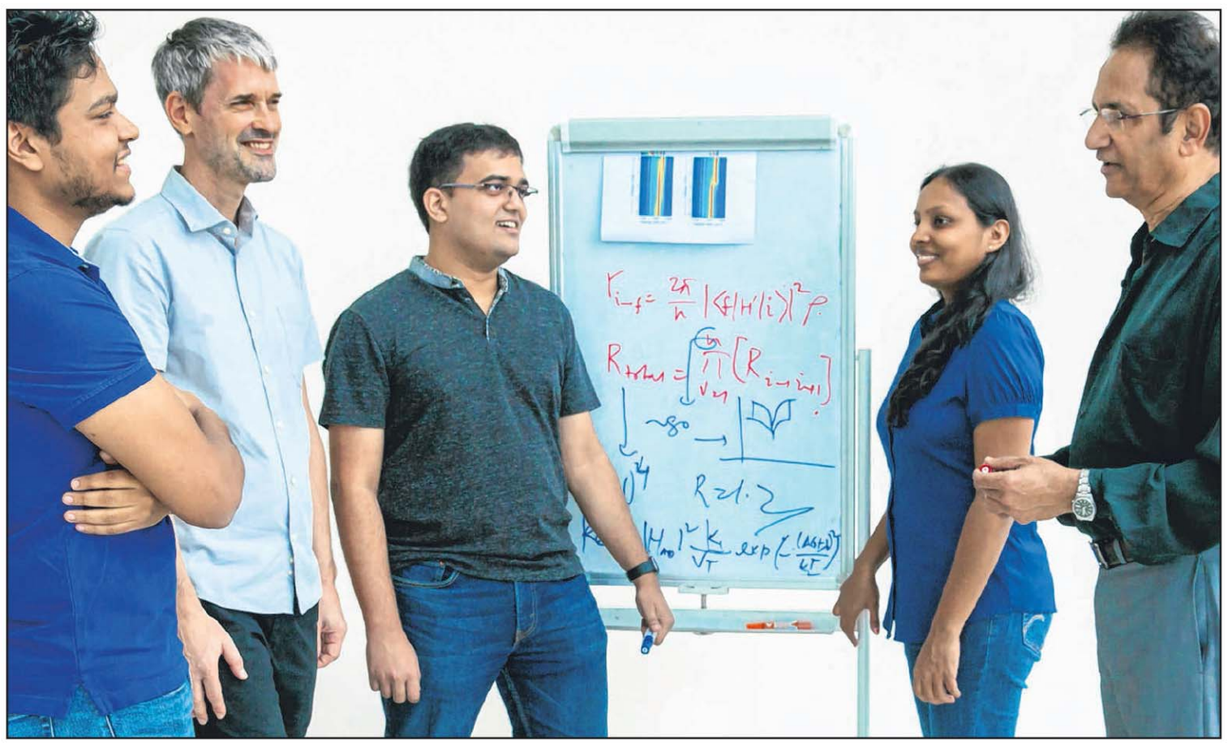
AN INTERNATIONAL research team led by scientists from the National University of Singapore (NUS) has pioneered the development of a novel thin organic film that supports a million more times read-write cycles and consumes 1,000 times less power than commercial flash memories.

It can store and process data for one trillion cycles and has the potential to be made even smaller than its current size of 60 square nanometres (with potential to be sub-25 square nanometres).

Professor T. Venky Venkatesan, director of NUS Nanoscience and Nanotechnology Institute (NUSNNI), who is the overall coordinator for the project, said: "The novel properties of our invention open up a new field in the design and development of flexible and lightweight devices.

"Our work shifts the paradigm on how the industry has traditionally viewed organic electronics and expands the application of such technologies into new territories."

The invention was first reported online in the journal Nature Materials on Oct 23.



Ground-breaking... NUS researchers with the overall coordinator for the project and director of NUS Nanoscience and Nanotechnology Institute, Professor T. Venky Venkatesan (extreme right). PHOTO: NUS

Addressing the problem

For years, the computer industry has sought to develop memory technologies with higher endurance, lower cost, and better energy efficiency than commercial flash memories.

The industry has kept away from using organic systems in memories due to their limitations in performance, questionable claims of reproducibility, and the lack of scientific clarity on mechanisms through which they exhibit their behaviour.

To address these challenges, Mr Sreetosh Goswami, a researcher from NUSNNI, successfully fabricated a novel organic resistive memory device that outperforms commercial flash memory in terms of endurance, energy efficiency and cost.

He developed 600 working devices that demonstrated impeccable reproducibility.

The new device utilises a transition metal complex, which was designed and synthesised by Professor Sreebrata Goswami and his team, comprising graduate students Santi Prasad Rath and Debabrata Sengupta, from the Indian Association for the Cultivation of Science.

The research team is planning to partner a consumer electronics company to commercialise the new technology.

In addition, the researchers are also looking at fabricating multi-state memories to produce neuromorphic memory devices (that resemble the brain) for artificial intelligence applications, one of the fastest growing technology fields today.