MONASH University

Media Release

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World class facility opens at Monash University

Monash University has become home to one of the world's most powerful electron microscopes, part of a new facility to study the structure of materials.

The double aberration corrected *Titan 80-300 cubed* transmission electron microscope, worth over $9 million can see atoms with a clarity never before achieved.

It is one of only four microscopes of this type in the world and is the first outside of North America.

The Victorian Minister for Innovation, Gavin Jennings, today opened the $37 million Monash Centre for Electron Microscopy (MCEM), which is home to the Titan. The Titan is the most powerful of ten high-performance microscopes housed in a purpose-designed building, one of the most stable ever constructed.

MCEM Director Associate Professor Joanne Etheridge said the new facility would allow scientists to gain a deeper understanding of the atomic structure of a wide range of materials.

"Everything in the world is made of atoms. The type and arrangement of atoms determine a material's properties, such as strength, colour and conductivity. By illuminating atomic structures, the powerful microscopes at MCEM give scientists the knowledge they need to develop new and better materials, such as faster computer chips, more efficient solar cells, smarter plastics and lighter, stronger metals for energy efficient transport."

Monash University Deputy Vice-Chancellor (Research), Professor Edwina Cornish, said the world - class research centre would enable new technological and industrial innovations, as well as help scientists understand the fundamental workings of the physical world.

The Centre, based at the Clayton campus of Monash University, was purpose-built to house the highly sensitive microscopes and uses special design features to protect the microscopes from mechanical, acoustic, thermal and electro-magnetic interference.

The Centre has attracted expert staff with specialist expertise in microscopy from leading centres around the world, including Oxford, Cambridge and Cornell universities.

MCEM supports a wide variety of disciplinary and interdisciplinary research projects, covering topics including corrosion, catalysis, optics, superconductivity, alloys, ceramics, polymers, biomaterials, microelectronics and nanotechnology.

The Centre serves and collaborates with researchers both nationally and internationally and also plays a key role in educating students in microscopy, supporting the research projects of over 100 postgraduate students.

Primary funding for the Centre and its instruments was provided by the Victorian Government, the Australian Research Council and Monash University

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FACT SHEET

MONASH CENTRE FOR ELECTRON MICROSCOPY

There are ten electron microscopes in operation at the MCEM, the most powerful is the aberration-corrected Titan.

- Technical name: Double Aberration corrected 300keV FEG-TEM (FEI Titan^3 80-300)
- Designed and manufactured in the Netherlands and Germany;
- Arrived in April 2008, via a specially commissioned front loading jumbo jet;
- Was packed in 19 crates weighing more than 10 tonnes;
- Took a team of nine engineers from Singapore, the Netherlands and Australia two months to assemble and commission;
- Has a resolution better than one tenth of a nanometre i.e. one tenth of a billionth of a metre;
- Can also acquire chemical and bonding information from just one or two atomic columns;
- Is one of only four operating in the world. The rest are based in North America;
- Has been isolated from electro-magnetic fields by the construction of an 18 tonne carbon-steel enclosure around it;
- Incorporates two aberration correctors that compensate for imperfections in the electromagnetic lenses, allowing the electrons to be focussed with very high precision. This is akin to fitting a microscope with glasses, allowing it to 'see' features that were previously too small to be seen.

All ten microscopes are located in the state-of-the-art, purpose-built MCEM building, which is the result of an extensive design and construction process to ensure the microscopes are isolated from every possible form of interference. The result is a building with some of the most stable laboratories in the world.

The building:

- Took two and a half years to design and construct;
- Is effectively nine free standing buildings situated within one large building, each with its own separate brick walls, floor and roof;
- Each of the nine “buildings” has its own free standing concrete slab up to one metre thick;
- Is fitted with water-filled ceiling panels to ensure still, silent air conditioning and a temperature variation less than <0.1°C per hour;
- Uses airlocks to minimise acoustic temperature and pressure changes when laboratory doors are opened;
- Has the air conditioning, water cooling and the electrical plant located in another building 12 metres away;
- Wherever possible, has been built with non-conducting materials such as wood and glass;
- Has had extensive work undertaken around it to reduce interference; six nearby electrical sub stations have been re-wired, underground sewerage, water and electrical pipes have been re-routed and a section of a nearby road has been closed;
- Has its own dedicated uninterruptible power supply.