

## Micro-manufacturing laboratory launched at CSIR

The CSIR, in partnership with the Advanced Manufacturing Technology Strategy (AMTS), has launched a state-of-art micro-manufacturing laboratory, which is the first platform dedicated to this technology area in South Africa.

The AMTS is a Cabinet-approved national strategy of the Department of Science and Technology. The AMTS implementation unit is hosted by the CSIR.

The micro-manufacturing laboratory has been established in the manufacturing science and technology research area of the CSIR and will focus on microsystems and microfluidics.



CSIR researcher, Mesuli Mbanjwa, machining with the Excimer laser machining equipment

This follows the completion of the Micro-manufacturing Strategy of South Africa that was facilitated by the AMTS with key contributions from the CSIR, the Central University of Technology, the Stellenbosch University and the Nelson Mandela Metropolitan University. Focus areas of the strategy are capacity building and skills development in this area.

The CSIR laboratory currently offers three doctoral studentships and one internship for capacity and skills development.

Some of the modern equipment and software that have been commissioned at the laboratory include:

- Comsol Multiphysics: this is a software package designed to aid in the modelling and simulation of physical systems. As an example, the flow of fluids in microfluidic systems can be modelled.
- Resonetics Excimer laser machining station: a system that is utilised to machine micro-components and micro-features.
- Zeiss confocal microscope: a microscope dedicated to the measurement of physical characteristics of the micro-manufactured parts.

According to Kevin Land, senior researcher at the CSIR, the laboratory is the first of its kind in Africa to provide a platform for micro-manufacturing. Pockets of dedicated micro-manufacturing do exist in South Africa, but no laboratory has been dedicated to this field of science. "We will initially focus our research on micro-fuel cells and microfluidics," he says.

The focus of microfluidics will be on developing modelling, manufacturing and testing capabilities for microfluidic devices. The immediate goal will be research on manufacturing critical components such as valves, pumps, channels, mixers and separators. These components will then be merged to form sub-systems, which will be linked directly to applications. A number of applications have been identified in the biomedical field, and the group is working closely with bio-medical groups in the design and development of these systems.

The microsystems focus is on the development of a micro-fuel cell as a technology demonstrator to build skills and capacity in the microsystems domain. The micro-fuel cell will be used for portable electronic

devices such as cell phones and notebooks.

Micro-manufacturing or micro-fabrication is the collective term for the technologies used to fabricate components on a micro-metre-sized scale with feature sizes in the 1-1 000  $\mu\text{m}$  range.

As an important emerging technology area, micro-manufacturing has been defined by the World Technology Evaluation Centre (WTEC) as an enabling, disruptive, transforming and strategic technology. It bridges the gap between the nano and macro-worlds.

With micro-factories, products can be manufactured where these are needed and the technology is available to more people. The technology can also bring about reduced capital investment, space and energy costs and increased portability and productivity.

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