A flagship South African facility for a double Cs-corrected TEM - From management to micrograph

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The main objective for the establishment of the Centre for High Resolution Transmission Electron Microscopy (HRTEM) was to provide a broad community of South African scientists and students with a full range of state-of-the-art instruments needed for nanoscale materials research. The Centre for HRTEM was established with the backing of the Department of Science and Technology and the National Research Foundation after the national nanoscience community and key industry partners supported the establishment of the Centre at the Nelson Mandela University due to its acknowledgement as a leader in the field of electron microscopy. The only double aberration-corrected atomic resolution TEM on the African continent is housed in the Centre along with three other state-of-the-art electron microscopes and sophisticated specimen preparation equipment. The key objectives of the Centre for HRTEM were to conduct the most advanced nanoscale materials research on the African continent using an analytical atomic resolution transmission electron microscope and related instruments, and to train highly skilled MSc and PhD graduates. Secondly, it aimed to transfer expert knowledge to the local industries and hence assist industry to bridge the gap between research and product commercialization which would significantly contribute to economic development and international competitiveness of some South African companies.

The establishment of the facility encompassed three main processes namely:

The development of a ten-year business plan for the centre; The development of suitable assessment criteria for the selection of the new electron microscopes for the centre; The design and planning of a dedicated state-of-the-art building to house the new equipment. These activities were completed with the acceptance testing of the new equipment and the official opening of the centre during October 2011 in the new building shown in figure 1. The opening included the unveiling of the double aberration corrected TEM, namely the JEOL ARM 200F shown in figure 2. The centre is currently staffed by eleven members, which are tasked with administration, technical and academic support for the many local and visiting students and researchers from other national and international universities as well as local industry. The day-to-day running of the centre is facilitated by a director and a manager and the activities are monitored by a university management committee who meets every quarter. An advisory board, which meet biannually, evaluates the outputs of staff and students. The outputs are measured in terms of key performance indicators as set out in the business plan. The instruments are regularly serviced via extended service/warranty contracts and the microscopes are optimized by an in-house diagnostic engineer who has been factory trained and acts as a first line of maintenance support by communicating with the local and international service engineers.

Since 2011, the Centre for HRTEM has supported more than 200 postgraduate degrees and published in high-impact-factor journals such as Nature. The Centre enjoys widespread recognition for its contributions to research, education, training and industry support to the benefit of South Africa.

Fig. 1. The Centre for HRTEM building at Nelson Mandela University.

Fig. 2. Image of the JEOL ARM 200F TEM in a custom built laboratory.