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Guest editorial

Nanoscience and Nanotechnology in South Africa

Nanoscience and nanotechnology certainly are buzz words in the 21st century, and much hype is associated with activities in these areas. What is it that has brought about the interest in this field? Billions of dollars are being invested worldwide by governments, including the South African government, in nano-activities.

The best way to understand what 'nano' is all about is to consider the following. Individual copper atoms do not conduct electricity. Nor do two, three or four copper atoms. Yet copper metal does – so where do the properties of copper change over from being non-conducting to conducting? This transition takes place in the nano range, with particle sizes typically <100 nm. The development of various modern techniques that allow us to 'see' atoms, and so investigate particles in this range, have now opened up this regime for study. And now that studies have commenced, a rich world of atom interactions leading to new materials and devices has become possible.

Although the field of nanotechnology is a relatively new one in this country, isolated projects in related areas have been going on for more than a decade. Metal particle sizes of 100 nm and less, for example, had been observed in catalysts before the word 'nanotechnology' came into use. The formation of the South African Nanotechnology Initiative (SANi) in the year 2002 ushered in a period of intense activity, and a unity of purpose that has accelerated the growth of nanotechnology as a research area in South Africa. The active involvement of the Department of Science and Technology (DST) in this initiative was a welcome development, and led to the adoption of a South African nanotechnology strategy and an associated 10-year plan for nanotechnology.

Since then, five national priority areas have been identified and towards this end, the National Research Foundation is currently supporting ongoing work on the use of nanotechnology to aid the provision of clean water; the synthesis of new electrocatalysts for use in fuel cells and other sustainable energy sources; the development of biosensors and biolabels for medical applications and the improvement of drug delivery systems (see *SAJS* **105**, 89; 2009); the use of nanotechnology in green chemistry and the synthesis of novel materials; and advances in the mining and minerals-processing industries and in the beneficiation of materials.

Virtually every higher education institution in South Africa has an active nanotechnology research group, and iThemba LABS, the Council for Minerals Technology, the Nuclear Energy Corporation of South Africa and the Council for Scientific and Industrial Research are some of the other institutions involved in 'nano' studies. Evidence of activity in the private sector includes companies such as Sasol and De Beers. Bilateral and multilateral relations with countries are in place to ensure that this sector in South Africa benefits from cooperation with more established centres in the developed world, as well as in other developing countries. These include a flagship India–Brazil–South Africa project on nanotechnology as well as agreements with Russia, Japan and Iran.

At the NanoAfrica '06 conference held at the University of Cape Town in 2006, South African scientists presented ongoing studies on many 'nano' topics. The publication of papers from this conference is long overdue, and we are indebted to *SAJS* for publishing them in this issue. They give some idea as to directions that 'nano' studies are taking in South Africa. More information on SANi can be obtained from the SANi web page: www.sani.org.za

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