

CSIR/DST NIDF: Crossing the nano chasm



Says Dr Mike Masukume: The chemical scale-up plant is versatile and can support complex processes that require high-pressure reactors.



Programme manager, Dr Manfred Scriba, says that The NIDF plays an important role in bridging the gap between the laboratory and commercial scale manufacture.



"As manager of the Polymer Formulation Facility, I make sure that we have a balance of development and characterisation capabilities required to develop new materials including polymer nanocomposites, says Dr Vincent Ojijo.

The CSIR together with the Department of Science and Technology (DST) have established the Nanomaterials Industrial Development Facility (NIDF) to enable industry, research entities and small, medium and micro enterprises (SMMEs) to develop and scale up high-tech materials.

The NIDF strives to enable industry, research entities and small, medium and micro enterprises (SMMEs) to develop and scale up high-tech materials. The focus at present is on using nanotechnology as a key enabler in polymer, cosmetics and other chemical related products. However, cheap imports and the difficulties involved in taking laboratory developed products to the market, as well as the lack of testing and scale-up facilities, often make it difficult for SMMEs and even large companies to start establishing new products and materials.

The NIDF was thus established to assist researchers and engineers to bridge the gap between materials development and commercialisation. In doing so, it anticipates the creation of additional jobs as one of the critical desired outcome of this programme.

NIDF's objectives and offering

The NIDF offers integrated access to three key research and development components, namely scale-up facilities, well-equipped characterisation laboratories and multi-disciplinary researchers. The facility was specifically designed to enable the transition from

laboratory to industrial scale.

The chemical processing plant is equipped with high temperature and pressure chemical reactors, process tanks, a filter press, dryers and a bag house. In the polymer formulation and processing facility we find a 40 l/day co-rotating twin screw extruder, a 500 kN injection moulding machine, a 5-layer cast sheet and blown film co-extrusion line and other smaller processing equipment.

Finally, the characterisation facilities available to users of the NIDF include all typical polymer characterisation and testing equipment as well as highly specialised instruments such as scanning and transmission electron microscopes, which allow material investigations at the nano-level (one nanometre is a million times smaller than a millimetre).

The NIDF offers support to SMMEs and larger companies alike by assisting with scaling up of operations – including further process/technology optimisation – to produce sufficient quantities of material to enable companies to test and develop the market. In addition, its researchers and engineers can help with the development of material applications as well as their characterisation and testing. It must however be



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emphasised that we are not able to provide SABS certification.

NIDF users benefit substantially

Scaling-up is a mandatory step in the commercialisation of scientific research and the NIDF thus plays a key role in the production of products in sufficient quantities for quality and market testing. It also provides the environment to undertake reliable cost estimation and capital budgeting analysis. In addition, users are able to generate design data for a future commercial plant and mitigate risks relating to their processes and technologies. The NIDF also prides itself on providing training and industry-ready learning to many interns.

Current projects

Some of the current projects include the production of nano-clays such as organophilic bentonite, synthetic hectorite and hydro-talcite, and their application in polymers and cosmetics. We are also assisting two Industry Development Corporation (IDC) -supported start-up companies with the development of nano calcium carbonate and carbon nanotube production processes.

Safety, health and the Environment (SHE)

The NIDF is well aware that nanotechnology and particularly the use of nanostructures in products is something new to the South

CSIR's nanotechnology research facilities: the NCNSM and the NIDF

The National Centre for Nano-Structured Materials (NCNSM) was created in 2007 as part of the implementation of Government's National Nanotechnology Strategy. The NCNSM focuses on the development of new materials using nanotechnology, and on the applications of nanotechnology in the manufacturing, water and health sectors.

The NCNSM also plays an important role in making available expensive and high-tech instrumentation used in nanotechnology research, to other researchers in South Africa, whether from higher education institutions, government institutions or private firms.

The DST-CSIR Nanomaterials Industrial Development Facility (NIDF) bridges the gap between bench-scale developments and industry. The scale-up facility forms part of the NCNSM and supports projects by offering flexible and multi-purpose scale-up plants, access to a skilled workforce, technical support in a well-equipped workshop and state-of-the-art equipment.

DST-CSIR NIDF contacts:

Council for Scientific and Industrial Research
1 Meiring Naude Road, Brummeria, 0184
PO Box 395, Pretoria, 0001
012 841 4738, mrscriba@csir.co.za

African industry. For this reason, we also assist users to identify and mitigate against potential health and safety aspects of a particular nanotechnology, through collaborative efforts with local universities. Being part of the DST-CSIR National Centre for Nanostructured Materials, the NIDF has established a Safety, Health and Environmental (SHE) system that plays a critical role in identifying and successfully managing these issues.

Accessing the NIDF

The NIDF is overseen by an advisory panel and managed by a steering committee, which evaluates proposals on merit and availability of resources. While it is generally expected that users of the facility will contribute towards the costs, the NIDF can give special assistance to SMMEs to access available funding sources.

The NIDF is open to receiving proposals at any time for consideration by the steering committee, which meets quarterly. □