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NANOSCALE SCIENCE AND TECHNOLOGY

Recent advances in our understanding of fundamental physical and chemical processes and in our ability to manipulate structures at the sub-micron and nanometer scale have given birth to a new field of scientific and engineering research – nanoscale science and technology. This emerging field of research is aimed at increasing control over material structures of nanoscale size (0.1 to 100 nm) in at least one dimension. The nano-world is populated by atoms, molecules and other nanoscale structures and systems.

Nanotechnology, therefore, comprises a cluster of emerging techniques combined from physics, chemistry, biology and engineering that are capable of manipulating matter at minute levels of detail – the nanoscale.

Opportunities for new nanotechnology based products arise from the unique properties of the technology. These opportunities fall into three distinct categories:

- Materials – nanostructuring of materials will lead to products with improved properties. Applications include construction, automotive and aeronautic transport technologies as well as coatings and sensors.

- Medicine and Biotechnology – nanobiotechnology will create new approaches to, e.g. understanding the genetic basis of disease or to novel therapeutic methods.

- Electronics – nanoelectronics will foster the development and manufacture of faster computers and memories with higher storage densities.

The goal of the nanotechnology research programme at NMRC is to perform fundamental scientific research and to establish core technology platforms in order to (i) develop a new understanding of nanoscale phenomena and (ii) to construct new nanoscale structures that may be used as a tool-kit to develop new applications in science and engineering.

Within this paper, I will describe the emergent field of nanoscale science and technology and the challenges and opportunities that will be presented by this technology for construction of the home of the future, the factory of the future and the fab of the future.