

Paper on Nanoelectronics

Nanotechnology offers potential revolutionary solutions that can enable developments in many areas of society such ICT, health care, mobility and to environmental challenges such as energy conservation and pollution prevention. Nanotechnology has the potential to deliver substantial benefits to the quality of life of citizens. The term nanotechnology is really an umbrella term that includes a vast amount of technologies spanning a wide variety of disciplines. Although the difference between the different types of nanotechnology can be somewhat blurred, it is possible to distinguish between some types.

Nanoelectronics is one type of nanotechnology and can be defined as the design. Characterization and application of structures, devices and systems by controlling their shape and size at the nanometric scale for the production of electronic products and services. The aim of this typical top down approach in the semiconductor industry is to make existing processes and dimensions ever smaller in order to create smaller, faster and more complex electronic devices on silicon chips. Thus, more capabilities can be generated for much less use of materials and energy and less production of waste per functionality produced. For the past thirty years design rules on chips have become smaller with the constant drive towards miniaturization (Moore's law) and by consequence electrical equipment has become cheaper, faster and smarter.

Other types of nanotechnologies include nanoscience; which is the study of phenomena and manipulation of materials at atomic, molecular and macromolecular scales, where properties differ significantly from those at a larger scale. This involves the bottom-up technology in the sense of chemistry, self-organization (supra-molecular chemistry) and physics.

Nanoelectronics: Environmental, Safety and Health issues

It should be noted that nanoelectronics manufacturing, aiming at the ever-ongoing miniaturization, which is so typical for the semiconductor industry, does not have the same environmental health, safety, social or ethical implications as other types of nanotechnology which are focused on creating novel engineered particles on the Nano scale. Semiconductor manufacturers do not manufacture any nanoparticle. However, the European Semiconductor Industry Association (ESIA) understands the public concerns related with the safety of nanomaterials and recognizes that there may be potential risks for human health and the environment. Particularly the significant reactivity of some nanoparticles may produce adverse impacts at a biological level. However, only very few of the chemicals used by the semiconductor industry contain particles with diameters in the nanometer range, and where used these particles are kept fixed in a liquid matrix. Advanced semiconductor manufacturing centers typically use these chemicals in automatic, closed supply systems, production tools, and systems with no exposure to employees. Besides, the European semiconductor industry has many potential risks posed to customers, since the chemicals (and the particles) are merely used to create tiny layer structures on the silicon surface and or not incorporated in the product.

In relation to nanoelectronics, the European semiconductor industry supports many initiatives to improve the level of environment, health and safety in its businesses. This is to be achieved by application of pragmatic control measures and with due observance of the development of scientifically based risk assessment and derived risk control. The industry pursues risk control based on a complete risk assessment, case by case. In respect of nanoelectronics and nanoparticles, the semiconductor industry will follow global programs aimed at gaining more insight in the risks and in the development of effective safety strategies and risk management measures. The European semiconductor industry sees it at its duty to participate in an open discussion on the advantages and potential risks of nanotechnologies and to inform employees, customers and other stakeholders accordingly. This is in line with the long history of responsible chemical management in all its aspects within the European semiconductor industry.



Roland König
Director Customer Care
Nexperia B.V.