Metrology at the nanoscale

Federico Ferrarese Lupi
INRIM

In the last decade a plethora of nanotechnology-based products increasingly pervaded the commercial marketplace. In this view the concomitant development of reliable characterization techniques and suitable standards is needed to control of the manufacturing processes, particularly where product characteristics are shrunk to the nanometric level. The need for a new dimensional nanometrology is evident in fields such as the microelectronics, in which the critical dimensions of the devices are scaled down to less than 10 nm and geometrical complexity of objects is increased. [ITRS] Consequently, major research and development efforts have to be undertaken in order to answer this challenge. To meet such need the European Association of National Metrology Institutes (EURAMET) is currently financing several projects devoted to provide to the European industry and manufacturing new trusted measurements, instrumentation, tolerance rules and procedures as well as traceability and calibration methods. These projects cover a large area of topics such as the dimensional metrology, the 3D-resolved chemical composition analysis, the electrical and environmental metrology.

In this tutorial many examples of how the Italian National Institute of Metrological Research (INRiM) is supporting this process will be discussed. The main mission of INRiM is to realize, maintain and develop the national reference standards of the measurement units of the International System (SI), consisting of seven base units - metre, kilogram, second, ampere, kelvin, mole and candela - and of derived units.