Nanotechnology and the Science and Engineering of Materials

The atomic structure proposed by the Danish Niels Bohr on the beginning of the last century has a fantastic similarity to the solar system planetary setup, in which each planet turns around its own axle, while moving around the sun. The effect of the gravitational field on big-mass celestial bodies presents analogy with that of the electromagnetic forces that guarantee the very organized setup of electrons in their orbits around the atomic nucleus. By studying the hydrogen atom, Bohr has understood the behavior of the electron in its own orbit and has generalized for more complex atoms how electrons may move from one to another orbit absorbing or emitting energy. He has therefore established the quantum and photon concepts as the basis for Quantum Physics, which gave him the 1922 Nobel Prize. Keeping the necessary proportions, these morphological and structural comprehensions within different magnitudes represent the core of the detailed description of materials. Nowadays, at the same time that we compute and measure in tons the forces that are necessary to make the macroscopic forming of materials into products that are useful in Engineering, we design phases on the details of the atomic arrangement, in nanometric scale, to reach the challenging properties that are required by modern applications. Nanoscience, already advanced in consistent formulations, begins its overflowing towards current use nanotechnology, in such a way that this expertise is not yet perceptible by the early user. The prospect is such that throughout this century many nanotechnology applications will become part of our daily life. A significant one is related to the possibility to produce quantum computers, bearing very high computing speeds. An important step for that was given by the 2012 Physics Nobel Prize winners, the French Serge Haroche and the north American David Wineland, who have developed experimental methods that allow measuring and handling individual quantum systems. But, the dawning of the quantum computers as real physical elements are yet dependent on the production of materials that would allow their fabrication. Therefore, to transform part of quantum Physics or conceptual Chemistry into Engineering reality is yet dependent on theoretical and experimental developments about materials, as a result of the intense nowadays scientific activity. The Materia Journal invites you to give your own incremental contribution in any subjects related to the area of materials.

Cordially,

Paulo Emílio V. de Miranda

Editor-in-Chief

Erratum

The present editorial has been submitted to the following correction on Dec. 12, 2012:
Where it appeared:

“The atomic structure proposed by the Norwegian Niels Bohr …”

It should be read:

“The atomic structure proposed by the Danish Niels Bohr …”