

# Preface

Single atom and molecule manipulations are now possible thanks to the scanning tunneling microscope (STM) and its derivatives opening a new technological field, named “Atom Technology” with the objective to produce one-day atomic scale logic circuits. STM operates in ultra-high vacuum (UHV) and thanks to its picometer scale precision, is able to construct or pattern an atomic scale circuit on a specific surface. The electronic chip such achieved and connected will be only suitable for in situ operation in the UHV. The requirement for future applications is to get a standalone chip, similar to electronics ones currently produced. Consequently, it clearly appears a special need for developing a dedicated packaging technology for this new kind of chip. The most constraining specification concerns the UHV control inside the package. Moreover, the surface quality needs to as perfect as possible (atomic roughness and large terraces) with a controlled surface structure and material band gap suitable for atom by atom manipulations. Among the available existing materials, silicon (100) wafers, commonly used in microelectronics manufacturing, are very promising because they are satisfying the requirement of surface quality and benefit from the very important know-how developed in the microelectronics industry.

The first exploration of such a nano-packaging technology has been launched with the Integrated European Project AtMol on January 1, 2011. A first international AtMol workshop took place at MINATEC, France, on June 2013 with participants coming from university laboratories, research institutes, and industries. This volume compiles most of the contributions presented during this event.

Besides the first driver for nano-packaging as described above, this workshop was also opened to a second trend which concerns nanomaterials for microelectronics. Nanomaterials bring new solutions for detection not only in sensor application or in passive components technology, but also in improving packaging of actual microelectronics components. In particular, CNT could be a solution for highly electrically and thermally conductive interconnections. CNT incorporated in an insulator matrix could also make the composite conductor. Biomaterials also appear as a new solution for nanoscale interconnections. By analyzing actual and future microelectronics and packaging requirements, it seems that solutions could

be found at the interface between a top-down approach lying on silicon and atomic scale technologies and a bottom-up approach consisting in the integration of functionalized nano-objects.

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