Dimension and positional metrology approaches in nanotechnology

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Civilization progress has settled on the invention of novel devices and machines that improved greatly our daily life. In the last century, a great variety of novel instruments used for collecting, processing, displaying and storing information have come into use. Particularly, the vertiginous progress around information technology has been closely related to the progressive miniaturisation of the components employed for the construction of such devices and machines. [1] Dimensions get smaller and smaller reaching down to the atomic scale. The density of devices is still destined to increase in the future and to become reality, nanotechnology has to overcome continuously its limitations. While well-defined metrology down to the micrometer scale, the nanometre scale is largely unexplored in the context of dimensional metrology solutions suitable for transfer to the manufacturing environment.

Dimensional and positional metrology can play a major role in reproducibility, quality control, setting up standards but much more: positional metrology of nanostructures can potentially be used to enforce legislation on trademark and production of high-value or high-tec manufactured parts and products.

In this talk I will address two powerful approaches to dimensional and positional nanometrology, namely sub wavelength diffraction and the opposite element approach. [2, 3]

The method will be illustrated in the few tenths of nm regime in the self-assembly of diblock copolymers. Our work devises sub-20 nm features on surfaces using block copolymers as alternative lithographic masks,[4, 5] by making use of nanoimprint lithography (NIL) technique.[6, 7]

References

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Figures

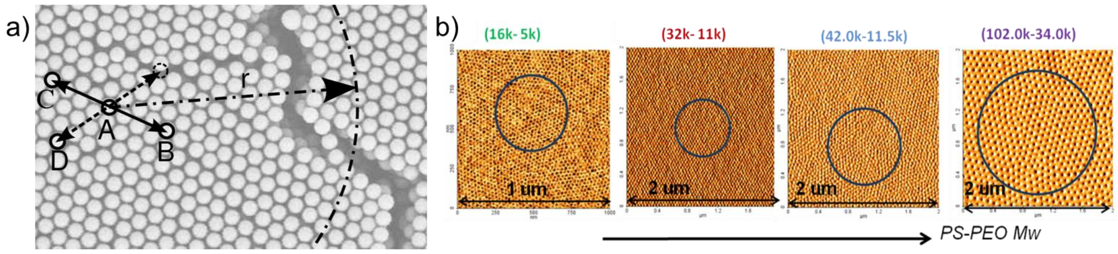

Figure 1. Opposite partner method for order quantification of self-assembled opals (a) and block copolymers (b).

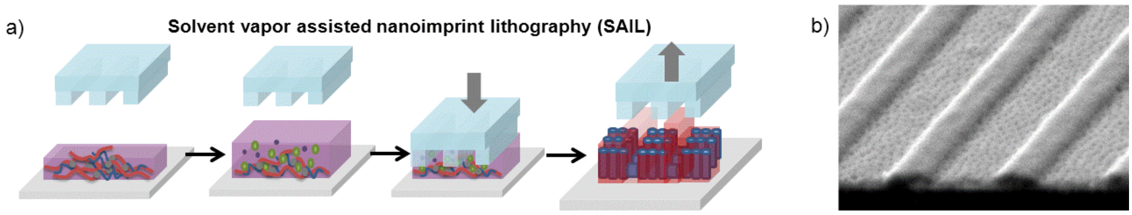

Figure 2. Solvent assisted nanoimprint lithography (SAIL) process workflow (a) and SEM image of a *poly(styrene-b-ethylene oxide)* thin film imprinted by SAIL.