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Jordi Fraxedas

Catalan Institute of Nanoscience and Nanotechnology (ICN2), CSIC and BIST, Barcelona, Spain

Characterization of directed self-assembled block copolymers prepared on nano-patterned surfaces

Block co-polymers (BCPs) are macromolecules built from two or more different monomers that are linked together. In the condensed state the BCPs tend to segregate due to the interactions among the different blocks and undergo a separation phase with controllable dimensions. When deposited on engineered surfaces where guiding patterns have been defined, the self-assembly can be intentionally directed building regular patterns. The interfaces generated between the substrate and each BCP domain play a key role in the final ordering. Directed self-assembly (DSA) of BCPs has emerged as a complementary alternative to traditional patterning methods providing resolutions below 10 nm (line width), low-cost processing and high throughput and is one of the most promising techniques for the development of the next generation of nanoelectronic devices and circuits since it is compatible with current manufacturing processes. I will report on recent experimental results of DSA-BCPs prepared on modified brush layers deposited on silicon wafers using different nanolithography methods, both using a resist modified by electron beam lithography (EBL) and oxygen plasma functionalization as well as without resist including EBL, atomic force microscopy (AFM) and parallel oxidation nanolithography. The DSA-BCPs films have been characterized using synchrotron radiation techniques such hard X-ray high kinetic energy photoelectron spectroscopy (HAXPES) and grazing incidence small angle X-ray scattering (GISAXS), which provide valuable information on the electronic structure of the relevant interfaces and on the dynamics of self-assembly, respectively. In addition, the mechanical properties of the nanometer-scale patterns (stiffness) have been quantitatively determined with AFM in dynamic mode.

Biography

Jordi Fraxedas graduated in Physics from the University of Zaragoza (Spain) in 1985 and earned his PhD in 1990 from the University of Stuttgart (Germany). Since 2007 he has led the Force Probe Microscopy and Surface Nanoengineering Group at ICN2. His research activity is focused on interfacial phenomena and surface science. He has coauthored more than 120 peer-reviewed scientific articles and published the books entitled Molecular Organic Materials (Cambridge University Press, 2006) and Water at Interfaces (Taylor & Francis CRC, 2014) and co-edited the book Molecular Materials (Taylor & Francis CRC, 2017)..

jordi.fraxedas@icn2.cat

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