Self-organized periodic sub-micrometric structures from Diluted Block Copolymer Solutions

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Sub-micrometric fabrication processes based on self-assembling block copolymers are coming important tools in nanotechnology owing to its properties that provide high regular and ordered patterns. Here, we report the self-organization of a block copolymer - poly(styrene)-b-poly(ethene-co-butene-1)-b-poly(styrene) - formed during evaporation of its solution, in which regular nanostructures with long-range order in the form of periodic ribbons and dots were formed only at critical polymer concentrations. The whole process comprised a sequence of events, involving undulations due to thermocapillary flow, dewetting and Rayleigh instability, as well as the contribution of phase segregation among the components of the copolymer. After the complete drying, two different patterns were observed: the parallel oriented ribbons and a hexagonal array of dots (Fig. 1). AFM pictures clearly show that the instability of the ribbons decays into dots. Also, the microphase separation phenomenon of the block copolymer played an important role in this process, establishing the thickness of the final nanostructures. As future applications, we obtained some replicas of PDMS from the self-organized copolymer structure.

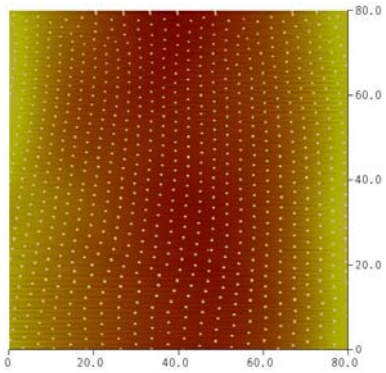

Figure 1: SEBS nanostructures hexagonally organized.

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