ORDER IN THIN FILMS OF SIDE-CHAIN FERROELECTRIC LIQUID CRYSTALLINE BLOCK COPOLYMERS

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The order in thin films of block copolymers consisting of a non-liquid crystalline chain [poly (isobutyl vinyl ether)] and a chiral liquid crystalline block was studied by X-ray specular reflectivity and atomic force microscopy. The block copolymer shows microphase separation of the two blocks and the liquid crystalline block exhibits the ferroelectric chiral smectic C mesophase at room temperature. Films of thicknesses less than 1000 Å were prepared by spin coating from a solution on float glass substrates and annealed in the smectic A mesophase. X-ray reflectivity measurements indicated that both the microphase separated polymer lamellae and the smectic layers in the liquid crystalline blocks were oriented parallel to the substrate. The electron density in the films, in the direction normal to the substrate, was determined from the fits to the reflectivity data and showed a lamellae period of 93 Å and smectic layer spacing of 31 Å. Extended smooth terraces separated by steps of height of lamellae period were observed at the surface by atomic force microscopy. The molecular structure of the film consistent with such experimental observations will be discussed.