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Front cover

[a] Examples of rheological phenomena

Polymeric liquid squeezes and climbs up a rotating rod (upper left) and its flow line shrinks at a die exit (upper right). Polymer chains stretched and aligned along the flow line give elastic force to the liquid and flow lines behave like a stretched rubber band. Injection-molded bodies may be birefringent due to frozen-in alignment of polymer (lower right), which must be avoided for optical devices. The type of cohesive force in the material is guessed from the shape of the broken surface when a cylinder is twisted (lower left); spiral for a chalk implies that it is strong to shear stress and breaks along the surface where the tensile stress is maximum.

[b] Newly Found Mechanisms of Polymer Crystallization

The figure shows the optical micrographs of poly(ethylene terephthalate) to evidence two new mechanisms involving microphase separation due to orientational fluctuation other than the usual direct crystal nucleation mechanism. Here a sudden change of morphology from spinodal decomposition (SD) to nucleation-and-growth pattern is seen at a spinodal temperature T_s = 213 ºC.

[c] Turned-up magnetization cores

The confinement of spins imposed by geometrical restrictions makes various spin structures with a size comparable to their dimensions. In the case of ferromagnetic dots, a magnetic vortex structure with a turned-up magnetization core has been introduced in many textbooks. However the direct observation of such vortex structures has not been achieved. The dot array of permalloy with 1μm diameter and 50 nm thick was prepared by electron beam lithography and lift-off method, and the observation of such vortex structures was attempted by magnetic force microscope (MFM). The figure shows the MFM image of the dot array. In the center of each dot, a white or black contrast corresponding to the turned-up magnetization core is clearly observed.

[d] Memory of Chirality

The structure of enolates was long believed to be achiral. However, chiral nonracemic enolate **A** with a racemization barrier of 16 kcal mol^{-1} at -78 ºC was found to be the crucial intermediate for asymmetric α-methylation of **1** to give **2** in 81 % *ee*. This asymmetric reaction occurs in the absence of any external chiral sources. Chirality of **1** is *memorized* in the enolate intermediate **A** in the form of dynamic C-N axial chirality.