Discovery of a novel ferrielectric phase of five-layer periodicity in binary mixtures of chiral smectic liquid crystals exhibiting unusual reversed phase sequence

Abstract

In a binary mixture system of ferroelectric and antiferroelectric liquid crystals whose major component shows an unusual reversed phase sequence of SmC*$_A$(1/2)ī SmC∗, a new phase with ferrielectric order of ýve layers has been discovered by the electric ýeld-induced birefringence (EFIB) measurements. The EFIB was measured using a photo-elastic modulator (PEM) set-up and by applying an in-plane electric ýeld to a homeotropic aligned cell ýlled with the binary mixtures of compounds with ferroelectric and antiferroelectric compounds. The contours of constant birefringence in the electric ýeldï temperature (Eï T) phase diagrams clearly indicate a distinct region corresponding to a new phase bordering the four-layer SmC*(1/2) on the low temperature side and SmC*$_Ü$ on the high temperature side. This new phase is unambiguously assigned to SmC*(3/5) whose structure has been calculated by Osipov and Gorkunov.

Keywords: antiferroelectrics; chiral smectics; ferrielectric phase of ýve layer periodicity; unusual reversed phase sequence