

Metastable behaviour during phase transition in the de Vries smectic A* liquid crystal phase

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We have observed a metastable sequence of optical texture with a batonnet morphology in the de Vries smectic A* (de Vries SmA*) phase formed by silicon-containing molecule.^[1] de Vries SmA* liquid crystal (LC) placed on silicon wafer and confined in silicon microchannel was analysed based on depolarized reflection light microscopy (DRLM) to observe the distinctive behaviour with a metastable structure. During rapid cooling from isotropic to de Vries SmA* phase, the batonnet structures was generated as an intermediate and metastable state, and then thermodynamically stable toric focal conic domains (TFCDs) were finally formed. This distinctive behaviour of phase transition was examined at the molecular level using grazing incidence X-ray diffraction (GIXD) techniques. We concluded that aggregation of LC molecules arise from the silicon part in de Vries LC molecule, leading to the formation of layered clusters called cybotactic structures.^[2-4] The understanding of unusual phase transition accompanied by a batonnet structure in de Vries SmA* phase can provide a clue to the unsolved properties of de Vries LC and advance the development of optoelectronic devices.

References:

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