Control of Periodic Defect Arrays of Smectic Liquid Crystal by Simple Multi-directional Rubbing Method

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The smectic liquid crystal phase has a layered structure which has an additional positional order as well as orientational order. With antagonistic anchoring conditions (random planar at the substrate interface and homeotropic at air interface) smectic-A liquid crystals form toric focal conic domains (TFCDs). In previous research, our group achieved highly ordered hexagonal array of TFCDs with confined micro-channels and surface treatment of planar polymer coating. Controlling the arrangement of TFCDs is requisite for a new type building block based on smectic liquid crystal. In this study, we introduce multi-directional rubbing method for square array of TFCDs. We could obtain square array of TFCDs on the perpendicular rubbed substrate. We searched the range of optimal rubbing strength condition about two perpendicular directions and investigated formation mechanism of square array of TFCDs.