Regulating Surface Anchoring Energy of Nematic Liquid Crystals using Reactive Mesogen

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Liquid crystals (LCs) are an intermediate phase which possess both long-range molecular ordering and fluidity. Due to these unique properties, LCs have been widely used to design stimuli-responsive materials, including triggered release systems, sensors, and actuators. In this context, precise control of interfacial properties (e.g., surface anchoring energy, the orientation of molecules) is significantly important because it determines the sensitivity and responsivity of LCs. In this regard, we proposed a simple and versatile method to manipulate the surface anchoring energy. Doping reactive mesogen (RM) into the vertical alignment polyimide (PI) layer allows us to control their polar anchoring energy with LCs. We observe the polar anchoring energy to increase with irradiation time of UV onto the RM doped PIs. In addition, we demonstrate the result to be associated with the formation of RM nano-spikes on RM-PI that facilitate vertical anchoring. we found RM monomers grew perpendicular to the substrates and form nano-spikes which cause the interdigitation of LCs. Also, the internal orientation of RM in our nano-spike contributes to the increase of polar anchoring energy.