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## Ordered liquid crystal hierarchical superstructures enabled by photoalignment

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Mesoscopic hierarchical superstructures bridge the micro worlds, and provide insights for the development of new functional materials. Much effort has been devoted to mimic the hierarchical organization observed in nature, however, the precise realization and rational control of ideal large-area hierarchical superstructures remains challenging. Liquid crystals (LCs) are excellent building blocks due to their extra field controllable self-assembly behavior and resultant physical property. Among them, cholesteric liquid crystal and smectic liquid crystal which are featured by periodic helices and ordered lamellar structures have drawn intensive attention. Here, a LC photopatterning technique [1,2] which enables the accurate, arbitrary and reconfigurable azimuthal angle control of LCs is introduced to manipulate the LC hierarchical superstructures. By this means, the in-plane helical axes of cholesteric liquid crystals [3] and the spatial smectic layer curvature of SmA phase [4] are rationally designed and arbitrarily controlled over centimeter scales. The growth of unique fingerprint textures including spiral and wave-like continuous gratings are demonstrated. And freely tailoring of the geometry and clustering characteristics of focal conic domains has been realized. This study broadens the fundamental understanding of self-assembled soft materials and enhances the construction of desired hierarchical superstructures. It will bring new opportunities to the design of novel advanced photonic devices.

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