Multi-Directional Colloidal Assembly on Wrinkled Liquid Crystalline Polymer Template


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The organization of the nano-structures is indispensable for understanding the physical phenomena at a nanometer level as well as for the photonic, plasmonic, electronic, and bio-medical applications. As one of the promising bottom-up methods, the colloidal assembling approach is very useful for constructing a variety of nano-structures due to the simplicity of scaling the physical size and realizing the desired dimensionality. Recently, a template-assisted technique using an elastomer with wrinkle patterns induced by the buckling instability\cite{1} was shown to fabricate one-dimensional colloidal structures. However, such strain-induced wrinkling process still has challenges to overcome the limited wrinkling direction and the structure failure.\cite{2}

In this work, we demonstrate a multi-directional colloidal assembly on an aligned liquid crystalline polymer (LCP) surface with wrinkle patterns. The anisotropic wrinkle patterns of the LCP film produced by the oxygen plasma treatment\cite{3} along the rubbing direction serve as a template for the one-dimensional assembly during a simple slit-coating process of polystyrene colloidal particles. Based on the LCP wrinkles whose period is similar to the particle size, the multi-directional colloidal assembly with high uniformity was obtained. Our wrinkled LCP approach to the colloidal assembly will have potential for use in more advanced photonic and bio-electronic systems.

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References:

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