Continuous Production of Mechanochromic Photonic Fibers using Microfluidic Jetting

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Photonic fibers that exhibit vivid structural colors are potentially useful for fabrics. In particular, the mechanochromic photonic fibers show dynamic color change by mechanical deformation, which can be used as raw materials to design color-tunable clothes. In this study, we continuously produce the mechanochromic fibers using microfluidic jetting. The jet of the photocurable dispersion which consists of silica particles dispersed in an elastomer-forming resin of PEGPEA is in-situ photopolymerized, resulting in the continuous production of elastic fibers. The silica particles form a nonclose-packed array in the pPEGPEA matrix, which enables structural coloration of fibers. When the fibers are stretched, the structural color is blue-shifted due to the reduction of interparticle distance between silica particles. The color change is highly reversible as the deformation is fully elastic. Moreover, when the red and blue colored fibers are horizontally and vertically woven, the woven fabric shows an anisotropic color change by horizontal and vertical stretching and releasing. Therefore, the mechanochromic fibers have great potential to use as raw materials for color-tunable clothes.