Design of Smart 'Polymer Printer' via Regulating Escape of Microcargoes from Liquid Crystals

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In recent years, increasing interest in self-healing materials are occurred due to their and long-term stability. Conventional methods to provide self-healing properties require specially designed polymers/hydrogels which limits diverse applications. To overcome the limitation, here we propose a simple and versatile strategy to access the self-healing characteristics via liquid crystals (LCs). We recently designed Smart LC system in which target stimuli triggers the escape of microcargoes that are elastically sequestered within the LCs [1]. By leveraging our recent work, we designed "polymer printer" that autonomously sense stimuli and then cause a polymerization. Specifically, the polymer printer consists of mini-wells of LCs where the microcargoes containing monomer (e.g., alginate) or initiator (e.g., multivalent salt) are initially trapped. In response to target stimuli, the printer triggers the escape of microcargoes, thus initiating the gelation in the surrounding environment.
These releasing form the gelation system which act as a polymer trap that can be used in the protecting fluidic channel where the contaminant can affect.