Microfluidics-assisted synthesis of submicron-sized heparinazed hydrogel

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Over the past decades, considerable interest has been shown in the fabrication of polymeric gels at the nano-to-micrometer scale. Nanogel especially offer significant advantages for drug delivery because oftheir nanoscale size and high stability compare to conventional microgel. Microfluidic flow-focusing devices made of PDMS provide a versatile approach to prepare monodisperse drops at a high frequency. However, they have significant drawbacks as the size of channel decrease: leaking can occur at the interface between PDMS and glass due to the high flow rates and pressure, and continuous-flow microfluidics tend to undergo chaotic oscillations in which flows vary uncontrollably. In this work, we overcame these problems by optimizing the design of microfluidic channel. The flow-focusing microfluidic devices were used to generate submicron sized emulsion droplets as a template for fabrication of nanogel. Biodegradable heparin was used as model polymeric materials due to the distinctive properties of heparin. Photo-crosslinkerable heparin was prepared by substituting the carboxylic groups of heparin with acrylate groups. Aqueous emulsion droplets of heparin were crosslinked by UV light in the microfluidic device.