Ultra-high resolution particle array based on capsulation-assisted transfer printing for the multiplexed detection of miRNA

박연경, 김성현, 이진환, 박현규†
한국과학기술원
(hgpark@kaist.ac.kr†)

We developed an ultra-high resolution microarray for the detection of miRNA based on a novel capsulation-assisted transfer printing method. First, PMMA spheres were self-assembled on a template and encapsulated with PDMS. The spheres were then transferred onto target surface via PI adhesive-assisted transfer. Then, QD-ssDNA probes were immobilized on the PMMA spheres. In the presence of target miRNA, the ssDNA probes could capture the miRNA, forming a duplex, which could be recognized by the Duplex Specific Nucelase (DSN). The DSN would then cleave only the ssDNA of the duplex, discharging the QD and releasing the miRNA, which is used for further rounds of cleavage reactions. As a result, a distinct decrease in fluorescence signal could be observed. Based on this strategy, we successfully detected miR-141, a biomarker for human prostate cancer, down to 2.6 fM. The clinical potential of this system was also validated by reliably quantifying miR-141 in HeLa cell lysate. In addition, by rationally designing the particle array and employing different QD conjugated ssDNA capture probes, this system could be extended for multiplexed miRNA detection.