Lithography-free nanofluidic concentrator based on droplets-on-demand system[1] MIAO YU, HONGBO ZHOU, SHUHUAI YAO, Hong Kong University of Science and Technology — Biomarkers are usually low-abundance proteins in biofluids and below detection limit of conventional biosensors. Nanofluidic concentration devices allow efficient biomolecules trapping by utilizing ion concentration polarization near nanochannels. However, once the electric field is turned off, the electrokinetic concentration plug cannot maintain its concentration status and starts to diffuse. In order to maintain the high concentration and extract the concentrated sample for further analysis, a good approach is to encapsulate these plugs into water-in-oil droplets. Here we developed a nanofluidic concentrator based on droplet-on-demand generator to encapsulate concentrated sample in nL droplets. The lithography-free nanochannels were patterned by thermal cracking on the surface of PS Petri-dish. The resulting nanochannel arrays were 30 nm in depth. In combination with microchannels on PDMS, the micro-nano hybrid chip was developed. We used FITC solution to demonstrate that the chip significantly increased the sample concentration for more than 100 folds within 5 minutes. By tuning the pulsed pressure imposed by the solenoid valve connected to the concentration channel, the system can generate a desired volume of droplet with a target sample concentration at a prescribed time.

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