Circular microfluidic system for electrochemical continuous monitoring of biochemical processes in emulsion droplets.

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Droplet microfluidics[1] has proved efficiency in simple manipulating of small volumes of liquid samples, especially in combination with electrochemical means of detection e.g. field-effect transistors, amperometric sensors, impedimetric sensors, and *etc*.[2,3] The abovementioned combination has grown in a lab on a chip approach for the detection of various substances.[4–6] However, the problem of precise droplet manipulation and long-term recirculation over individual sensors still present. Here we present a microfluidic design and the way of liquid control that enables recirculation real-time monitoring of hundreds of droplets with nanowire-based impedimetric sensors. The long-term recirculation of droplets over the nanowire area can be used for monitoring biochemical reactions whose real-time analysis of the kinetics can be advantageous for a more precise analysis. The combination of circular microfluidics and nanosensors allows long term recirculation of droplets over the sensor which can be used for monitoring of bio-chemical reactions within solutions or cell/bacteria cultures. The generation of hundreds of droplet reactors provides high reliability and throughput of the result due to statistical reasons, precise flow-rate manipulation allows viability of the assay and impedimetric way of monitoring provides an immersive analysis of the embedded compounds.

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