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An Integrated microfluidic platform for liquid droplet in gas flow generation with in liquid flow collection and manipulation POOYAN TIRANDAZI, CARLOS H. HIDROVO, Northeastern University — Discretization of biological samples and chemical reactions within digital droplets is a powerful technique which has rapidly emerged in many biochemical syntheses. The ability to generate, manipulate, and monitor millions of microdroplets in a short time provides great potential for high throughput screening and detection in microbiology. Here we report a microfluidic device for the formation of uniform microdroplets (50μm-100μm) using a high speed gas as the continuous phase. Gas-borne droplets are generated in a chip-based flow-focusing device fabricated in PDMS, and travel along the gaseous microchannel and are subsequently captured within a second liquid phase. The droplets are then transferred and collected in a minichamber and move into the manipulation section for further processing operations on the drops. All these steps are performed automatically in a single multilayer chip. This integrated microfluidic platform for generation, collection, and manipulation of the droplets provides great opportunities for monitoring and detection of gas-analytes. Utilizing the generated picoliter airborne droplets feature lower reaction times and higher transfer rates as compared to conventional air sampling techniques. Thus, it can greatly facilitate the investigation of airborne analytes by interrogation of the digital droplets using different analytical techniques. Furthermore, the presented liquid-in-gas generation method can be utilized for production of oil-free microparticles and microcapsules used in the food industry and for drug delivery.

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