

Centrifugal step emulsification for digital quantification of nucleic acids based on a lab-on-a-disc platform

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Microdroplets in oil provide miniaturized compartments for numerous chemical or biomolecular reactions, and it can be used for absolute quantification of nucleic acids, such as ddPCR. Herein, we introduce the centrifugal emulsification based on a lab-on-a-disc platform for the fast, easy, and cost-effective production of uniform droplets. Monodispersed droplets from 90 μm to 320 μm of diameter were formed within a few minutes. The fluorocarbon oil usage per aqueous phase was significantly reduced than the conventional droplet generator by more than a factor of 5. This method can apply to a sample-to-answer molecular diagnostic system: proceed with the isothermal amplification of target nucleic acid and digital quantification after droplet formation. The overall process time and cost of analysis could be highly reduced with minimized handling steps, compared to the conventional digital PCR method.